MOTOROLA
test equipment

DIGITAL ANALYZER / CONTROLLER

R-1800A

MP MASTER
MA34749

68P81069A90-A

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LIMITED WARRANTY
(EXCLUDES EXPORT SHIPMENTS)

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(b) The seals on non-user serviceable components or modules are broken;

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EPS-30828-O

MOTOROLA INC.
Communications
Group

R-1800A DIGITAL ANALYZER/CONTROLLER

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7/21/81-SK

FOREWORD

1. SCOPE OF MANUAL

This manual is intended for use by experienced technicians familiar with similar types of equipment. It contains all service information required for the equipment described and is current as of the printing date. Changes which occur after the printing date are incorporated by Instruction Manual Revisions (SMR). These SMR's are added to the manuals as the engineering changes are incorporated into the equipment.

2. MODEL AND KIT IDENTIFICATION

Motorola equipments are specifically identified by an overall model number on the nameplate. In most cases, assemblies and kits which make up the equipment also have kit model numbers stamped on them. When a production or engineering change is incorporated, the applicable schematic diagrams are updated.

As diagrams are updated, information about the change is incorporated into a revision column. This revision column appears in the manual next to the parts list or, in some cases, on the diagram. It lists the reference number, part number, and description of the parts removed or replaced.

3. SERVICE

Motorola's National Service Organization offers one of the finest nation-wide installation and maintenance programs available to communication equipment users. This organization includes approximately 900 authorized Motorola Service Stations (MSS) located throughout the United States, each manned by one or more trained, FCC licensed technicians.

These MSS's are independently owned and operated and were selected by Motorola to service its customers. Motorola maintenance is available on either a time and material basis or on a periodic fixed-fee type arrangement.

The administrative staff of this organization consists of national, area and district service managers and district representatives, all of whom are Motorola employees with the objective to improve the service to our customers.

Should you wish to purchase a service contract for your Motorola equipment, contact your Motorola Service Representative, or write to:

National Service Manager
Motorola Communications and Electronics, Inc.
1303 E. Algonquin Road
Schaumburg, Illinois 60196

4. REPLACEMENT PARTS ORDERING

Motorola maintains a number of parts offices strategically-located throughout the United States. These facilities are staffed to process parts orders, identify part numbers, and otherwise assist in the maintenance and repair of Motorola Communications Group products.

Orders for all parts *except* crystals, active filters, code plugs, channel elements, and "Vibrasender" ® and "Vibrasponder" ® resonant reeds should be sent to the nearest area parts center. Orders for instruction manuals should also be sent to the area parts center.

When ordering replacement parts or equipment information, the complete identification number should be included. This applies to all components, kits, and chassis. If the component part number is not known, the order should include the number of the chassis or kit of which it is a part, and sufficient description of the desired component to identify it.

Orders for crystals, channel elements, active filters, PROMs, code plugs, and reeds should be sent directly to the factory address listed on the following page. Crystal and channel element orders should specify the crystal or channel element type number, crystal and carrier frequency, and the chassis model number in which the part is used.

Orders for active filters, PROMs, code plugs, "Vibrasender" and "Vibrasponder" resonant reeds should specify type number and frequency, should identify the owner/operator of the communications system in which these items are to be used; and should include any serial numbers stamped on the components being replaced.

5. ADDRESSES

5.1 GENERAL OFFICES

MOTOROLA Communications and Electronics Inc.
Communications Group Parts Dept.
1313 E. Algonquin Rd.,
Schaumburg, Illinois 60196
Phone: 312-576-3900

5.2 U.S. ORDERS

WESTERN AREA PARTS
1170 Chess Drive, Foster City,
San Mateo, California 94404
Phone: 415-349-3111
TWX: 910-375-3877

MIDWEST AREA PARTS
1313 E. Algonquin Road
Schaumburg, Ill. 60196
Phone: 312-576-7322
TWX: 910-693-0869

MID-ATLANTIC AREA PARTS
7230 Parkway Drive
Hanover, Maryland 20176
Phone: 301-796-8600
TWX: 710-862-1941

EAST CENTRAL AREA PARTS
12995 Snow Road,
Parma, Ohio 44130
Phone: 216-267-2210
TWX: 810-421-8845

EASTERN AREA PARTS
85 Harristown Road,
Glen Rock, New Jersey 07452
Phone: 201-447-4000
TWX: 710-988-5602

PACIFIC SOUTHWESTERN AREA PARTS
P.O. Box 85036
San Diego, California 92138
Phone: 714-578-2222
TWX: 910-335-1634

GULF STATES AREA PARTS
8550 Katy Freeway
Suite 128
Houston, Texas 77024
Phone: 713-932-8955

SOUTHWESTERN AREA PARTS
P.O. Box 34290
3320 Belt Line Road,
Dallas, Texas 75234
Phone: 214-241-2151
TWX: 910-860-5505

SOUTHEASTERN AREA PARTS
P.O. Box 368
Decatur, Georgia 30031
Phone: 504-981-9800
TWX: 810-766-0876

5.3 CANADIAN ORDERS

CANADIAN MOTOROLA ELECTRONICS COMPANY
National Parts Department
3125 Steeles Avenue East,
Willowdale, Ontario M2H 2H6
Phone: 416-499-1441
TWX: 610-492-2713
Telex: 065-25191

5.4 ALL COUNTRIES EXCEPT U.S. AND CANADA

MOTOROLA, INC. OR MOTOROLA AMERICAS, INC.
International Parts Dept.
1313 E. Algonquin Road
Schaumburg, Illinois 60196 U.S.A.
Phone: 312-576-6492
TWX: 910-693-0869
Telex: 722443 or 722424
Cable: MOTOL PARTS

5.5 FACTORY ADDRESS FOR CRYSTAL, CHANNEL ELEMENT, ACTIVE FILTER, CODE PLUGS, PROMs, AND RESONANT REED ORDERS

ALL MAIL ORDERS
Motorola, Inc.
Component Products Sales & Service
P.O. Box 66191
O'Hare International Airport
Chicago, Ill. 60666

CORRESPONDENCE
Motorola, Inc.
Component Products Sales & Service
2553 N. Edgington Street
Franklin Park, Illinois 60131

PERFORMANCE SPECIFICATIONS	
Display:	32 character, alpha numeric; vacuum fluorescent
Keyboard:	Full typewriter format Membrane switches with audible feedback
Program Capacity:	16 program ROMs, (2k, 4k, or 8k byte each)
Applications RAM:	1k byte basic, expandable to 4k byte
I/O Control Lines:	8 ports of 8 lines each, plus 16 additional control lines. (TTL logic level compatible, PIA ports, optionally expandable to 16 ports.)
Logic Probe Input:	Impedance—10 MΩ at TTL levels Threshold levels—Low .8 V High 2.3 V Max. Frequency—300 kHz (program dependent) Max. Input Level—+ 15 V Indicator Mode—Front panel LED's plus accessible by user program
Analog Input:	Impedance—300k ohms min. Measurement Range: −1.25 V to +1.25 V Resolution—8 bits Max. Input—±15 V Sampling Time—200 μs min. (program dependent) Indicator Mode—User program controlled DC Accuracy—5% of full scale
Environmental:	0° to +50°C operating −25° to +65°C storage Meets EIA Std. RS152B specs for mechanical shock and vibration as well as humidity.
Input Power Requirement:	100 to 130VAC, internally switchable to 200 to 260VAC 50/60 Hz line frequency 120 watts max. input power (with max. accessory load)
Accessory Power Connector on Front Panel for user applications and interface panels:	+5 V dc, 1 Amp (Regulated) +15 V dc, .4 Amps (Regulated) −15 V dc, .2 Amps (Regulated) +34 V dc, .5 Amps (Unregulated)
Physical:	Width—18.25″ (46.4cm) Depth—14″ (35.5cm) Height (cover closed)—7″ (18 cm) Weight—25½ pounds

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

MODEL CHART
DIGITAL ANALYZER/CONTROLLER

CODE ● = QUANTITY OF ONE SUPPLIED
2, 4, 6 = NUMBER INDICATES QUANTITY SUPPLIED

*RTL-1009A includes RTP-4009A Power Supply and RTL-4082A Display Board Kits

MODEL NUMBER	R-1800A	R-1800A/220	R-1800A/M	R1800A/M220	R-1801A	R-1801A/220	R-1801A/M	R-1801A/M220
DESCRIPTION	BASIC DIG ANAL/CONT	220 V	ADD'L 3k RAM	ADD'L 3k RAM, 220 V	W/READER/PROGRAMMER	W/READER/PROGRAMMER, 220 V	W/READER/PROGRAMMER, ADD'L 3k RAM	W/READER/PROGRAMMER, ADD'L 3k RAM, 220V
ITEM								
RTL-1009A	●	●	●	●	●	●	●	●
RTL-4079A	●	●	●	●	●	●	●	●
RTL-4080A	●	●	●	●	●	●	●	●
IV80304A93	●	●	●	●	●	●	●	●
IV80305A19	4	4	4	4	2	2	2	2
30-80336A36	●	●	●	●	●	●	●	●
65-890033	●			●	●		●	
65-898635		●		●		●		●
RTL-1008A					●	●	●	●
IV80305A29					2	2	2	2
51-82609M93			6	6			6	6

The above models also include the following hardware required to assemble the front panel to the case:

MOTOROLA PART NO.	DESCRIPTION
2-121841	NUT, Lock: 6-32; 6 used
2-131435	NUT, Lock: 4-40; 2 used (trunnion brkt mtg)
3-80349A64	SCREW, Machine, 10-24 x 1/2" Phillips pan head; 2 used
4-13240	WASHER, Fibre; 2 used
4-821624	WASHER, Nylon; 2 used
7-80349A69	TRUNNION Bracket (for lid support)

EPS-32406-O

GENERAL SAFETY INFORMATION

The R-1800A Digital Analyzer/Controller is factory set to operate from either 115V or 230V (nominal) ac primary power, the unit is labeled accordingly when shipped. Make certain the main ac supply voltage is the same as indicated on the unit before applying power. Refer to the Installation Section for power conversion details.

WARNING

Exercise adequate safety precautions when servicing the unit, high voltage exists within the unit.

The R-1800A must be plugged into a grounded 3-wire receptacle. Use of an adapter without the ground connection is improper and may lead to equipment damage or operator injury.

1. DESCRIPTION

1.1 INTRODUCTION

1.1.1 The R-1800A Digital Analyzer/Controller forms the nucleus of a system designed to service Motorola 2-way radio products. It is especially suited to service complex radio products which are microprocessor based.

NOTE

The R-1800A operates in conjunction with separately supplied pre-programmed application packages which must be added to make the unit functional. Application software, provided in the form of pre-programmed Read Only Memory (ROM) Modules, is designed to service a specific Motorola product.

1.1.2 The basic R-1800A is a bus organized microprocessor system consisting of the Motorola MC6808 Microprocessor, a field of 16 application ROM locations, multiple I/O ports which are software definable, and separate executive and application Random Access Memory (RAM). An application program ROM, when installed in one of the 16 sockets on a circuit board within the unit, is accessed via the typewriter style keyboard. Instructions typed in by the operator are displayed on a 32 character alphanumeric display. Prompts, to guide the operator through the application function or product diagnosis procedure, are also displayed on the alphanumeric display.

1.1.3 A reader/programmer module option, that interfaces with the digital analyzer/controller via I/O ports, provides the added capability to program, read, and verify: Programmable Read Only Memories (PROMs), memory modules, and code plugs. The module is contained in the top cover of the unit.

1.2 CASE

1.2.1 The digital analyzer/controller is housed in an attache-style case made of high impact plastic. The larger half of the case serves as the base for the control panel and all electronic and mechanical hardware of the main unit. The lid provides mounting and power distribution facilities for accessory items, such as the RTL-1008A Reader/Programmer Module. The lid is designed to carry up to four single-width (3-inch) modules. Unused module positions are covered with blank panels. Panels and modules are easily removed for substitution, expansion, or servicing via quarter turn-type captivated fasteners.

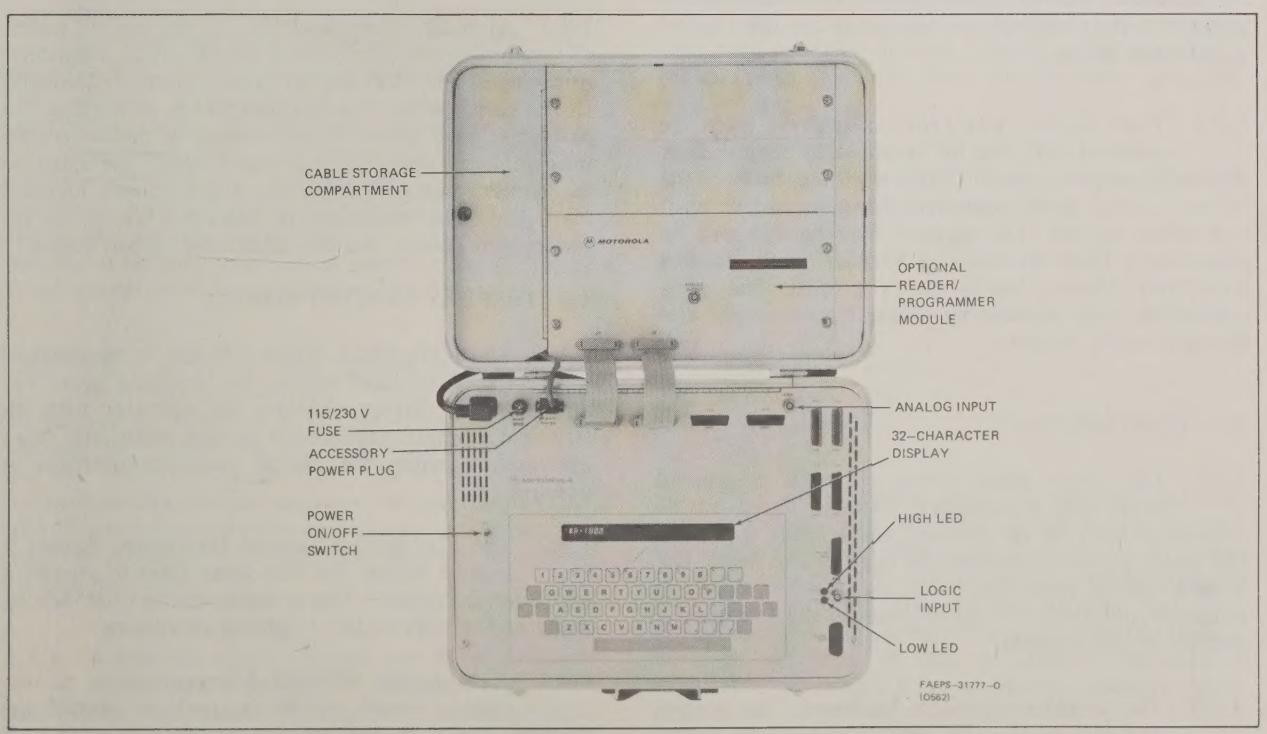

Figure 1. Location of Panel Display Indicators, Controls, and Connectors

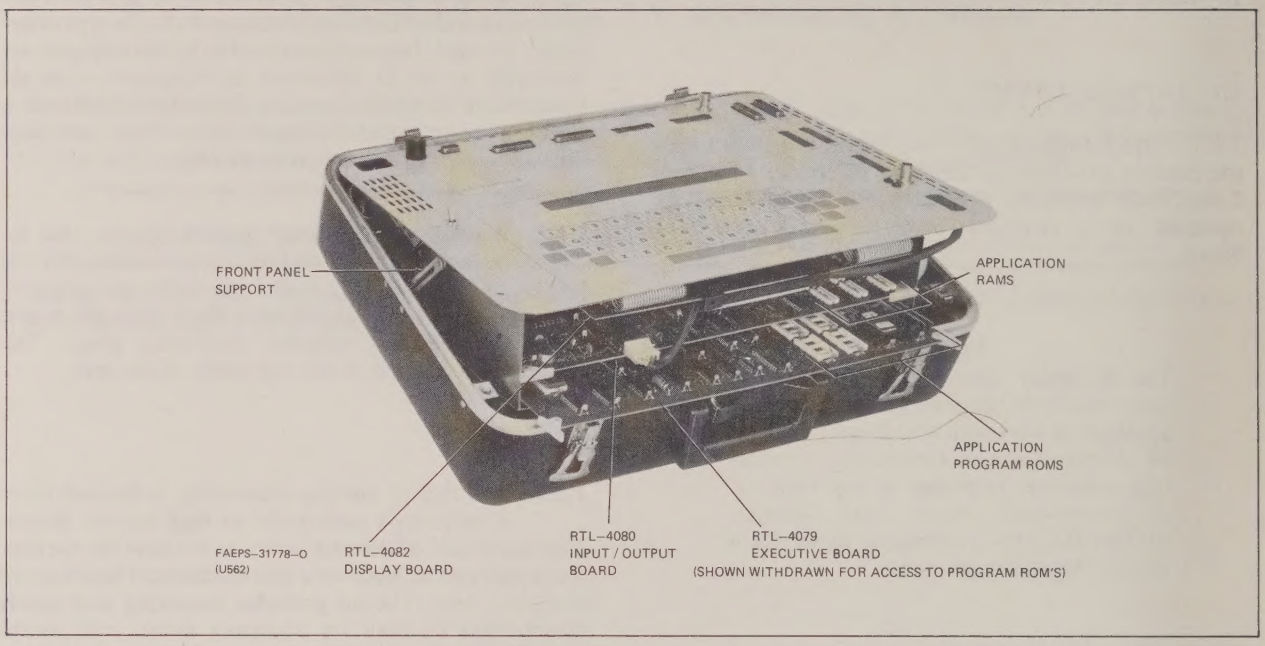

Figure 2. Board Location Detail

1.2.2 The lid also includes a storage compartment for carrying accessory items such as jumper cables, probes, and small tools. The ac power cord for the main unit is stored in the compartment along with the accessory power distribution cable. These cables plug into their respective connectors on the control panel when in use.

1.2.3 The digital analyzer/controller may be operated with the lid attached or removed. A sliding lid support attached to the right hand side of the lid and control panel secures the lid in an upright position when opened. The support may be defeated by detaching it from the trunnion bracket on the control panel and allowing the lid to fully open. The lid is removable from the base by sliding it to the right and disengaging the hinges.

1.3 CONTROL PANEL

1.3.1 The front panel serves as both a control panel and a mounting chassis. The panel is secured to the case via brackets and a hinge riveted to the metal extrusion around the edge of the base. The hinged control panel facilitates the installation of application modules, covered in detail in the Installation Section of this manual.

1.3.2 The membrane switch keyboard, for control and data entry, is an integral part of the control panel. The 54 keys are arranged in a familiar typewriter format. The power on/off switch, ac receptacle, fuseholder, logic probe indicator LED's and various input and output connectors are mounted on the control panel. These are explained in detail in the Operation Section of this manual.

1.3.3 Attached to the back side of the control panel, within the case, are all the electrical assemblies of the main unit. The display board is mounted directly to the panel behind the keyboard area. A cooling fan assembly, two power transformers, a power supply module, and a printed circuit board chassis are bolted to the control panel. The circuit board chassis includes card guides for mounting the executive board, the input/output board, and one additional option board.

1.4 DISPLAY CIRCUIT BOARD

1.4.1 The RTL-4082A Display Board is mounted to the front panel behind the keyboard area. The alphanumeric display provides the operator with instructive prompts, verification of data entry, and other information while the digital analyzer/controller is operating.

1.4.2 The 32-character vacuum fluorescent display is located behind the blue-green filter to provide a high contrast display. This is visible over a wide viewing angle and in high ambient lighting conditions.

1.4.3 A Motorola MC6802 Microprocessor on the display board (U118) is used to control the display. The microprocessor program is located in a read only memory (U116). Through a peripheral interface adapter (PIA, U117) the microprocessor receives

instructions from the data bus, at the card edge connector, to display the required information. In response, the microprocessor controls the display multiplexing circuitry through the other half of the PIA.

1.4.4 Keyboard multiplexing circuitry is also included on the display board, although it is not controlled by the display board microprocessor. The keyboard terminates at the display board via connectors P101 and P102. Through one half of the PIA the executive microprocessor (see Section 1.5) scans the keyboard when searching for an entry. The keyboard is arranged in an 8 by 8 matrix (refer to R-1800A Intercabling Diagram) that includes all keys except RESET and BREAK, which are hard-wired. The matrix is scanned by the binary-to-octal decoder (U123) which drives each of the eight rows.

1.4.5 Multiplexer (U122) selects each of the eight columns to detect a key closure. When a closure is detected the logic state of PA0-PA5 lines identifies the key pressed.

1.5 EXECUTIVE CIRCUIT BOARD

1.5.1 The RTL-4079A Executive Circuit Board is located in the card guide chassis. In most cases this board is installed in the lower position, although it can be operated in any of the three positions.

1.5.2 The core of the executive board is the Motorola MC6808 Microprocessor (U201). The executive ROM (U203) contains a monitor, subroutines, and self-test programs to operate the digital analyzer/controller. The MC6808 also executes application programs selected from one of up to sixteen preprogrammed software modules (ROMs) located in sockets on the board (U216-231). (Refer to the Installation Section of this manual and the instruction section included with each application program kit for additional information concerning these ROMS.)

1.5.3 When power is first applied to the digital analyzer/controller the executive microprocessor executes a self-test program and initializes the system for user commands. After the operator enters a program name via the keyboard the executive microprocessor searches the application ROM area for the requested program. Upon locating the program the executive microprocessor proceeds to execute the program steps.

1.5.4 Besides the microprocessor and ROM's, the executive board includes 1k-byte of RAM (U204 and U205). This is used for temporary storage of data. A 4 line-to-16 line decoder (U208) selects one of the 16 application ROM's, and miscellaneous control logic and buffers interface the 16 address lines and 8 data lines to the various memory and control devices. The executive circuit board communicates with the other components in the system via the 60-conductor bus at its card edge termination. A PIA (U202) on the executive circuit board provides the interface to the keyboard scanning circuitry and the display controller. The PIA also is used to interface to the logic probe, analog-to-digital converter, and tone generator circuitry on the I/O circuit board (see Section 1.6).

1.6 I/O CIRCUIT BOARD

1.6.1 The RTL-4080A I/O Circuit Board is located in the second position of the circuit board chassis. It interfaces to the executive board via the 60 conductor bus, and to products being tested and/or accessory modules in the case lid via ribbon cabling to front panel mounted connectors.

1.6.2 The principal purpose of the I/O board is to interface the product under test or accessory to the executive microprocessor while it is executing the application program. Four peripheral interface adapters (U301-U304) provide this function. Under control of the application program, each PIA may be operated as an output, to stimulate or control the externally connected equipment, or as an input to gather data. In total, the four PIA's provide 64 program controlled I/O lines. The PIA's on this board terminate at the front panel mounted connectors labeled I/O 1, 2, 5, and 6. Hexadecimal address assignments are also indicated. On I/O 6 only, six of the pins are buffered (U326) to provide open collector outputs to meet special interfacing requirements. As such, these pins are never programmed as inputs.

1.6.3 Separate from the PIA's the I/O board provides four additional function :

- logic probe circuitry
- analog-to-digital conversion hardware
- tone generator circuitry
- application RAM

1.6.4 The logic probe circuitry operates in conjunction with the front panel mounted input connector and LED indicators. A standard X1 scope probe such as the RTL-4011A can be connected to the BNC-type connector. The circuitry provides high input impedance and TTL-compatible logic level thresholds; however, up to 15 V may be applied. Monostable multivibrators (U322) serve to lengthen short duration input pulses so as to be visibly detectable on the LED's. Illumination of both LED's simultaneously indicates that the input is a pulsed signal.

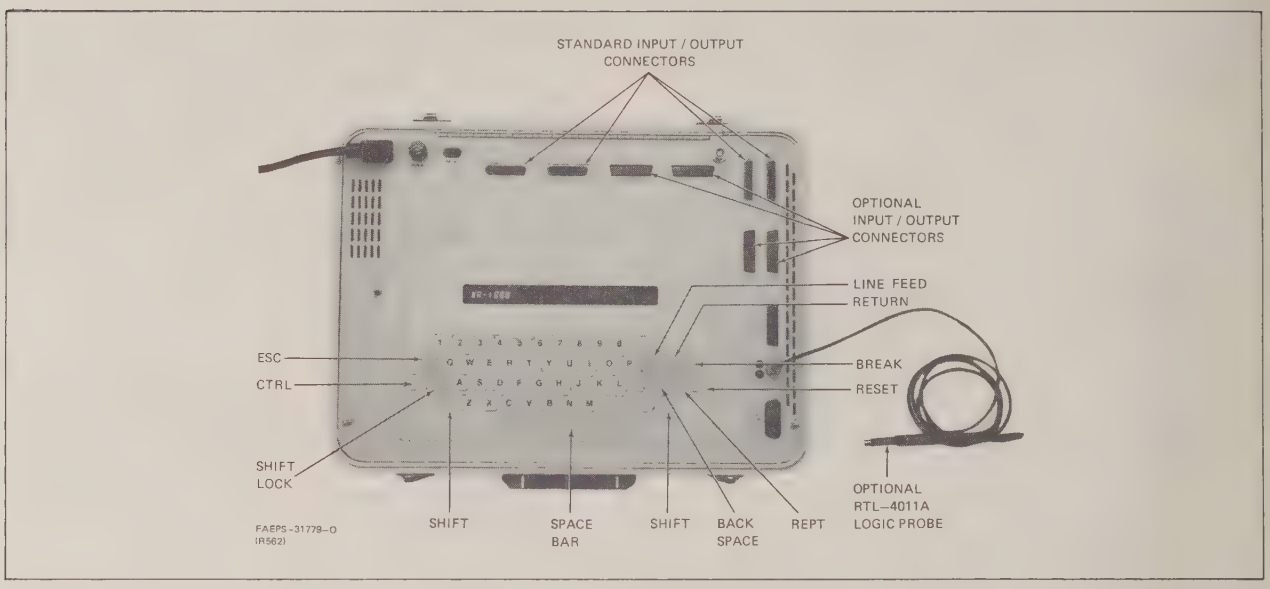

Figure 3. Front Panel Display

1.6.5 The logic level LED's operate independent of the executive board. Under control of application programming, the executive microprocessor can detect the logic state of the input signal via the executive board PIA.

1.6.6 The analog-to-digital conversion circuitry is provided for special purposes and is strictly controlled by the application software. The conversion technique (e.g. successive approximation) and conversion time is determined by the particular software algorithm used in the application program. The hardware is designed around a digital-to-analog (D/A) converter (U330) and a voltage comparator (U329). The useable analog input range is -1.27 to $+1.28$ volts. Current regulator Q303 assures a constant 1.27 volt offset between the analog input and the comparator input, allowing operation with the single-supply D/A Converter.

1.6.7 The tone generator circuitry, including an audio transducer, is used as an annunicator. Controlled by the executive microprocessor through its PIA, the annunciator can be triggered by the application program, for example, to alert the operator to some condition or end of test. Typically, the annunicator sounds on initial power-up and with each keystroke of the keyboard as feedback to the operator.

1.6.8 The standard I/O board includes 1k byte of RAM for application program use. An additional 3k bytes of memory is optionally available and is required for use with certain programs. Refer to the instruction section provided with the application program kit to determine requirements.

1.7 POWER SUPPLY MODULE

1.7.1 The RTP-4009A Power Supply Module is mounted to the underside of the control panel and provides all operating voltages for the digital analyzer/controller. It operates in conjunction with power transformers T1 and T2, separately mounted to the panel, and filter capacitor C1 mounted on the right hand side of the circuit board chassis.

1.7.2 The power supply module includes a printed circuit board assembly mounted to a heat sink. A bridge rectifier (CR10) and 2 series-pass power transistors (Q1 & Q2) are also mounted on the heat sink and wired to the circuit board assembly.

1.7.3 Connectors on the circuit board are used for all input and output connections. AC primary power, transformers T1 and T2, and filter capacitor C1 are connected to the power supply module through P1. Connector P2 provides all output voltages for the circuit boards in the main unit. Distribution is via the power distribution cable assembly. Power for the accessories in the lid of the case is distributed through connector P3 and the accessory power cable assembly.

1.7.4 The power supply provides the following outputs:

- $+5$v — the primary operating voltage for the logic circuits of the unit. This regulated supply includes current limiting, short-circuit protection, and over/under voltage shutdown protection. In the event of shutdown due to a fault condition, the power supply must be reset by turning off primary ac

power and turning it back on after waiting a moment. If the fault condition is no longer present, the power supply will restart and the audio annunciator will sound as verification.

- +15 volts regulated — available for options and accessories. (Refer to the Performance Specifications at the front of this manual for rating information.)

- −15 volts regulated — required for operation of the A/D converter on the I/O board; also available for options and accessories. (Refer to the Performance Specifications at the front of this manual for rating information.)

- +34 volts unregulated — available for accessories (Refer to the Performance Specifications at the front of this manual for rating information.)

- +55 volts regulated — for operating the fluorescent display.

- 6.3 volts ac — filament voltage for the fluorescent display.

1.7.5 The digital analyzer/controller may be operated from either a 115 V nominal or 230 V nominal ac power source. The selector switch is located on the power supply module. Refer to the Installation section of this manual for conversion details.

1.8 OPTION KITS

The option kits are described in separate instruction manual supplements. Each comprises a circuit board for installation in the card cage and cables for interconnection to front panel connectors. Option kits provide for up to 4 additional I/O ports (labeled I/O 3, 4, 7, and 8), and standard RS-232-C Serial Interface and IEEE-488 Interface Bus functions.

2.0 READER/PROGRAMMER MODULE

2.1 GENERAL DESCRIPTION

2.1.1 There are two models of the reader/programmer available:

- the RTL-1008A which mounts in the cover of the R-1801 Series Analyzer/Controller unit,
- the RTL-1013A which mounts in the control panel of the R-1821 Series Analyzer/Controller (console model).

2.1.2 Both units interface with the analyzer/controller by means of two 25-conductor cables and one 9-conductor power cable. For some applications an additional shielded BNC cable is required which connects the analog output to the digital analyzer/controller. The reader/programmer is designed to be used only in conjunction with the digital analyzer/controller. The power to this module, as well as control, is derived from the analyzer/controller, which means the reader/programmer functions as a slave unit to the analyzer/controller.

2.1.3 The function of the reader/programmer is to facilitate programming as well as verification (read) of PROM's, EPROM's, or highly unique Motorola code plugs. The programming intelligence for each PROM or code plug is provided by unique software (Application Program Kit) contained in the digital analyzer/controller. The programming is initiated by means of the keyboard entry, and the PROM data verification is displayed on the control panel of the analyzer/controller. The PROM interface to the reader/programmer module is provided by an adapter module, which is connected to the reader/programmer via a 60 pin edge connector. Basically, the adapter module contains an appropriate PROM or code plug socket and a set of resistors to select proper voltage and current programming parameters. Due to the variation of socket wiring and resistor values, each adapter module is unique for a particular application and is identified by a model number.

2.1.4 The programming software contains instructions to identify the required adapter module and will enable the programming cycle only if and when the appropriate adapter module is inserted. The identification of the adapter module is accomplished by means of a unique (to each adapter) five bit code in the form of five position jumpering combinations.

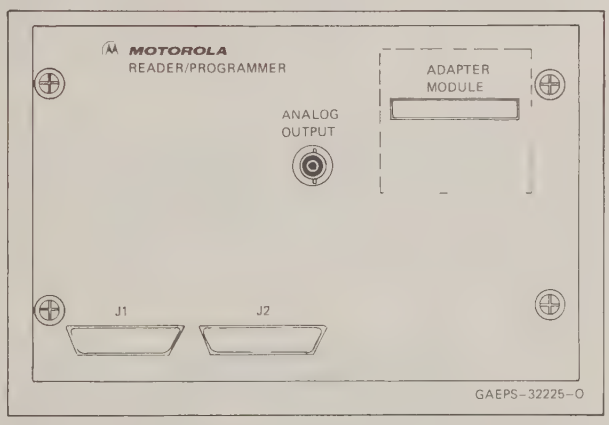

Figure 4. Reader/Programmer Front View

2.2 FUNCTIONAL DESCRIPTION

2.2.1 Operational Modes

The logic of the reader/programmer has the capability to suit the programming and read requirements of a great variety of bipolar PROM's, EPROM's, or code plugs. The interconnections of the adapter module command the logic circuits (U14, U15, U20, U25, Q20, Q40, Q41, Q42) of the reader/programmer to provide the specified functional characteristics unique to each PROM.

2.2.2 General

The program addressing and control data generated by the software located in the analyzer/controller is applied to the reader/programmer module via two 25-pin connectors, J1 and J2. Nine lines feeding input/output data (D1 through D9) function in a bidirectional manner, i.e. carry write data to the programmer and read or I.D. data from the programmer. The read/write line (J2—Pin 4) in conjunction with the adapter module I.D. (J1—Pin 4) coordinates the respective read data, read I.D. and write data cycles. The address and control data lines are unidirectional and function explicitly under software control. The circuitry of the reader/programmer processes the information received from the digital analyzer/controller and presents it in a reorganized form to the PROM or code plug for programming. This is achieved by interfacing the deisred PROM with the reader/programmer by means of an appropriate adapter module, which plugs into the reader/programmer through a 60 pin edge connector.

2.2.3 Address Data

To accommodate up to 8k byte PROM's, 12 address lines (A0 through A11), and one chip select line are available. The first 7 address lines have dual addressing capability; TTL voltage levels or constant current sourcing. U1, U2, U3, and U25, provide the buffering and parallel addressing TTL drive; transistors Q30 through Q36 function as current switches for one-address-line-at-time current addressing.

2.2.4 Write Data

Nine data lines, D1 through D9 are used to transmit programming (write) data. The data buffering and parallel TTL data drive is provided by U5, U6 and U7. The current programming data is applied in a sequential manner to the PROM by conducting current switches Q1 through Q9.

2.2.5 Read Function

Dual data read capability is provided; parallel TTL logic level read, applicable to most PROM's or EPROM's and serial data read to interpret the logic levels of some Motorola code plugs operating at low voltage levels.

2.2.5.1 Parallel Read

Parallel read circuitry is enabled when the read/write line is in logical "1" state. Analog switches Q11 through Q18 are conductive and buffers U12 and U13 become enabled. The parallel data is read off the output of the PROM and presented to the digital analyzer/controller on D1 through D9 data lines.

2.2.5.2 Serial Read

Typically, serial read is employed with various Motorola code plugs operating at low voltage logic levels. The output of the code plug is monitored as an analog voltage immediately following the program cycle. This is essential in order to retain the ability to identify which bit of a possible nine parallel bits is being read at the particular time. This is accomplished by employing data entry memory (U9, U10, U14) plus the priority encoder (U8). The memory retains the data bit information until the read function is completed and is reset at the end of the read cycle. The priority encoder monitors the data memory and responds with a three bit binary code, which controls the multiplexer. The multiplexer (U11) responds to the binary code and selects one of eight outputs and couples it to the analog amplifier (U21). Thus, the priority encoder, in conjunction with the data multiplexer, performs the bit identification. The output of U21 is the analog read output that is made available for external use, and it appears on the front panel as the analog output (J5). A BNC jumper cable connects the analog output to the digital analyzer/controller where the analog voltage is translated to digital form. Potentiometer R105 is used to calibrate the output of U21.

2.2.6 Adapter Module Identification (I.D.)

Five adapter module I.D. bits originate at the adapter module and are output by three state buffers (U4). These are presented to the digital controller/analyzer on input/output data lines D1 through D5. The I.D. data is made available only when requested by the digital analyzer/controller in the form of a logic low ("0") on the adapter module identification enable line (J1 pin 4).

2.2.7 Voltage and Current Sources

2.2.7.1 Vcc Voltage Source

Programmable voltage regulator U28 supplies Vcc to the PROM. The level of Vcc can be programmed to four discrete levels selected by four resistors located on the adapter module (pins $\overline{A}$, Z, Y, $\overline{B}$). Decoder U17 accepts the enable and control inputs (on J2 pins 15, 16) and provides drive to the Vcc selecting resistors.

2.2.7.2 V_{pp} Voltage Source

The V_{pp} voltage source is primarily designated to the V_{pp} function for EPROM's, however, there are other applications for this voltage source. Two inputs (J2 pins 17, 18) enable and control the V_{pp} decoder (U18). The outputs of the decoder provide drive to three V_{pp} voltage selecting resistors located on the adapter module (pins T, U, V).

2.2.7.3 I_P Current Source

This constant current source (U23, Q23, Q24) is dedicated to bipolar PROM programming which requires relatively high current (approx. 200 MA) to blow the fusible links. A single resistor located on the adapter module (pin W) selects the desired current level. Potentiometer R104 is used to calibrate the I_P current output.

2.2.7.4 I_{PP} Current Source

This constant current source is designed to operate at lower current levels (< 200 mA.), and is intended to be used for current addressing. A single resistor located on the adapter module (pin X) selects the required I_{PP} current. Potentiometer R106 is used to calibrate the Ipp output.

2.2.7.5 +30 Volt Regulator

This regulator provides +30 volts to the I_P current source, I_{PP} current source, and V_{PP} voltage source.

2.2.7.6 −5 Volt Regulator

This regulator provides −5 volts to satisfy needs of certain EPROM's. Transistor Q25 turns the regulator on and off as commanded by the input on J2—Pin 25.

3. INSTALLATION

3.1 GENERAL SET-UP PROCEDURES

3.1.1 Transporting the Unit

The R-1800A Digital Analyzer/Controller is housed in a portable carrying case, and can easily be transported for servicing equipment at a job site. Always store accessories and cables in the lid compartment to protect the surfaces of the panels. When transporting the unit in a vehicle, stabilize the unit from shifting around.

3.1.2. Setting-up the Unit

Step 1. Place the unit on a firm horizontal surface, base down, on the job site or in the service shop.

Step 2. Release the 2 clasps and lift the lid to the upright position. The sliding lid support will lock the lid in a position just past vertical. If desired, the lid may be removed by first detaching the support from the trunnion bracket on the control panel, and next sliding the lid to the right to disengage the hinges. If accessories in the lid are to be used, position the lid directly behind the base.

Step 3. Open the door to the storage compartment and remove the ac power cord and any accessory cables.

Step 4. Remove the free end of the accessory power cable (if accessories in the lid are to be used) and close the compartment door while guiding the cable for clearance at the lower right hand corner of the door.

Step 5. Plug in the accessory power cable to the connector marked ACC PWR.

Step 6. Plug the ac power cord into the receptacle and into a suitable grounded 3-wire ac outlet.

Step 7. Refer to the instruction section provided with the application program kit for specific set-up procedures of accessories and cables.

Step 8. Refer to the Operation Section of this manual.

3.2 APPLICATION ROM INSTALLATION

NOTE

Installation of Application ROM's requires no special tools or technical knowledge. If, however, assistance is needed, contact your service representative or Motorola Test Equipment Service Center (phone 800-323-6967). Outside of the United States contact your Motorola Test Equipment Service Representative.

Step 1. Following the set-up procedure of Section 3.1.2, Steps 1 and 2 place the unit on the work surface and remove the lid completely.

WARNING

Do not plug the ac power cord in.

Step 2. Loosen the 2 front panel Phillips head screws, just until the threads disengage from the mounting brackets.

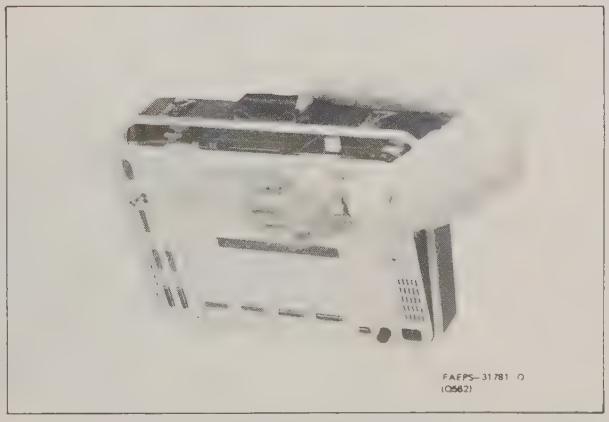

Figure 5. Bottom Case Removal

Step 3. (See Figure 5) Lift the unit by the handle to a vertical position, with one hand supporting the front panel. Tilt the unit beyond vertical until the front panel hinges out of the case.

Step 4. Holding the panel out of the case, return the unit to a horizontal position and set the support latch on the left hand side by pulling the latch towards the front of the unit.

Step 5. (See Figure 2) Release the printed circuit board retainer across the right hand corner of the card cage.

Step 6. Locate the executive board (in the bottom or top position) and pull it out of the cage using the extractor levers on each side of the board. Slide the board out of the cage as far as necessary to access an ususued socket in the program ROM area.

Step 7. Following the CMOS handling precautions given at the back of this manual, remove the program ROM from its protective bag and conductive foam pad, and carefully insert the device into any unused socket. Be sure to check for proper orientation, identified by the notch on one end of the device and the corresponding legend screened on the printed circuit board. Also, check to see that all pins are properly engaged in the socket.

Step 8. Check to see that the power plug at the left rear corner of the board (2-pin connector) is properly plugged in, and slide the board back into the card cage. Visually align the rear edge of the circuit board with the chassis mounted connector and press the board firmly into position.

Step 9. Engage the circuit board retainer, release the support latch, and lower the panel into the case. Tighten the front panel screws.

Step 10. Test the unit for proper operation (See Operation Section of this manual).

3.3 APPLICATION RAM INSTALLATION (EXPANSION)

Installation of the expansion RAM integrated circuit is similar to that of the application ROM's. Follow the steps outlined in Section 3.2. At Step 6, locate the I/O board (in the middle position) and partially remove it to access the six RAM sockets on the right hand side. At Step 7, note that the orientation of integrated circuits on the I/O board are opposite that of the executive board. At Step 8, be sure not to pinch the I/O ribbon cables as the board is re-inserted into the card cage.

3.4 AC POWER CONVERSION

3.4.1 The R-1800A may be operated from either a 115 V ac nominal or 230 V ac nominal primary power source, 50 or 60 Hz. Units having the suffix "/220" after their model number are factory set to operate from an ac power source of 200 V to 260 V, and are shipped with a suitable ac cord. Local electrical codes should be followed when selecting and mounting a compatible outlet plug.

3.4.2 Should conversion to the other voltage system ever become necessary, perform the following procedure:

Step 1. Follow the procedure outlined in the Maintenance Section (Section 5.2) and remove the control panel from the bottom case.

Step 2. (Refer to Figure 6) Locate the 115/230 V switch on the RTP-4009A Power Supply Module, and move the actuator to the desired position.

Step 3. Re-assemble the unit per the procedure of Section 5.2.

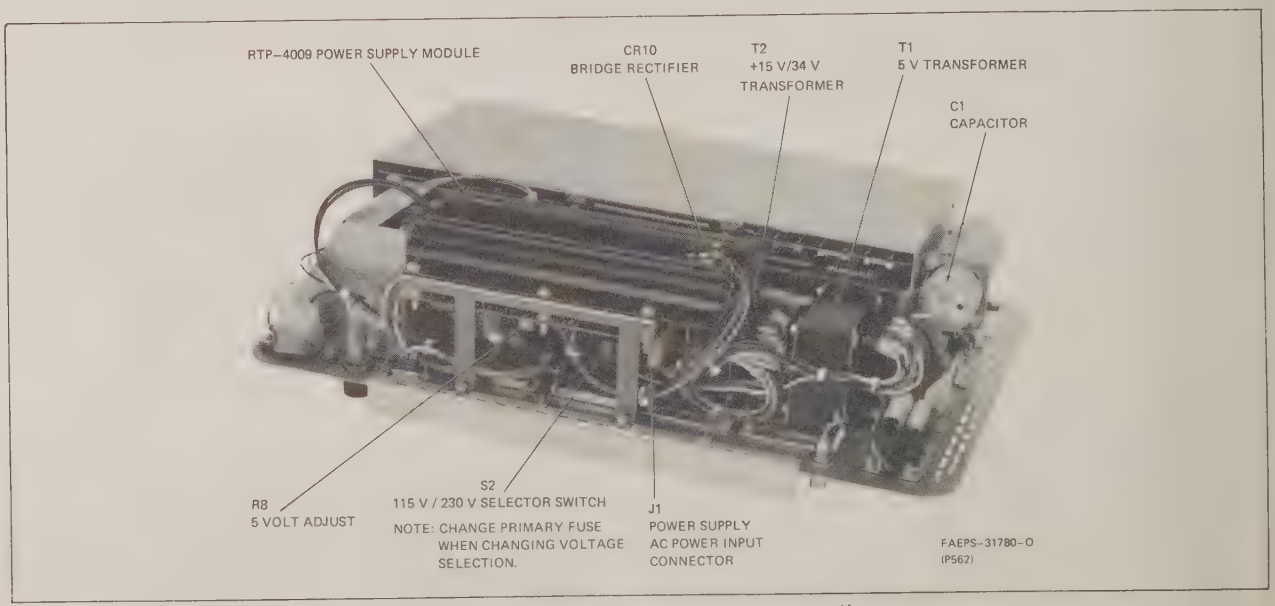

Figure 6. Component Location Detail

Step 4. Replace the ac fuse with the proper value:

Application	Fuse Size	Motorola Part No.
100-130V	1.5 Amp	65-890033
200-260V	0.75 Amp	65-898635

Step 5. Replace or modify the ac cord per local code requirements.

4. OPERATION

4.1 GENERAL OPERATING INSTRUCTIONS

4.1.1 When power is applied to the R-1800A, a power-on reset pulse is generated by logic circuitry on the executive board. This pulse causes restart sequences to be entered by both the display and executive software. After a brief self-test, the message "DIGITAL ANALYZER/CONTROLLER" will appear in the display window, followed shortly by a copyright message which contains the software revision number. These two messages last less than one-half second each.

4.1.2 The R-1800A prompt message appears next. The message reads: "ENTER PROGRAM NAME _" with the underscore character (_) blinking. The user should now enter the name of the software module he wishes to access. If a mistake is made during data entry, the BACKSPACE key may be used to erase the last character entered, and the correct character may be entered in its place. After the proper program name has been entered, the RETURN key should be pressed. This signals the R-1800A to begin execution of the requested software modules.

4.1.3 The keyboard of the R-1800A is very similar to a standard typewriter keyboard and it functions in much the same way. The LINE FEED key is useful only if the R-1800A is being used with an external printer. The REPT key, when held down in conjunction with another key, causes that character to be repeated. The ESC key can be used to start special two-key control sequences, some of which are described in the application manuals.

4.1.4 The two most important control keys are RESET and BREAK. The RESET key causes the R-1800A to re-enter its start-up sequence. The BREAK key can cause the monitor to be re-entered at several different points, depending on the phase of execution. See the application manuals for further information.

4.2 OPERATING CONTROLS, INDICATORS, and CONNECTORS

4.2.1 All display indicators, controls, and connectors used by the operator are located on the front panel and accessory cover panel of the R-1800A Digital Analyzer/Controller. The following describes their use and function:

- AC RECEPTACLE—3 prong input for 115 Vac or 230 V ac.
- FUSE HOLDER—Bayonet style, fuse extractor type knob. Replace blown fuses with same type and rating
- POWER SWITCH—2 position ON/OFF switch
- 32-CHARACTER DISPLAY—Provides an alpha-numeric readout of information generated by either the applications program, executive program or keyboard entry.
- KEYBOARD—For entering alpha-numeric information into the system.
- IEEE-488 CONNECTOR (OPTIONAL)—Used as an interface to make the R-1800A compatible with instruments according to the IEEE-488 format organization.
- LOGIC INPUT—Provides an input to the logic detector; input is TTL compatible
- HIGH LED—Indicates when a logical TTL "high" (>2.4 V) is present at logic input.
- LOW LED—Indicates when a logic low (<0.8 V) is present on the logic input.
- RS-232-C CONNECTOR (OPTIONAL)—Used as an interface to make the R-1800A compatible with equipment configured according to the RS-232-C format for serial data transmission.
- I/O1, I/O2, I/O5, I/O6 CONNECTORS—Used as an interface between the device under test and the R-1800A. These outputs are TTL compatible except for six outputs of I/O 6 which are open collector outputs.
- I/O3, I/O4, I/O7, I/O8 CONNECTORS (OPTIONAL)—Used as an interface between the R-1800A and any device under test.
- ANALOG INPUT—Provides an input for the A/D converter. The input voltage range is $+1.28$ V to -1.27 V dc.
- ACC PWR CONNECTOR—Used to supply power to the case lid and optional modules.

5. MAINTENANCE

5.1 ROUTINE MAINTENANCE

A regular program for maintenance and inspection every five to six months is recommended for this unit. As part of this program, the unit should be checked as follows.

Step 1. Disconnect ac power and remove the unit from the case (See Bottom Case Removal paragraph.)

Step 2. Make a thorough visual inspection of all wiring and cables. Check for frayed, loose, or burned wires.

Step 3. Inspect components for their physical integrity. Look for burned or cracked components, loose solder connections, leakage of insulation compounds, and general physical damage. Ensure that all plug-in components, such as integrated cirucits, transistors and connectors, are firmly seated in their mating sockets. Never unnecessarily remove and replace a plug-in component.

Step 4. Operate user switches and controls and check for loose or sticking shafts, etc.

Step 5. Inspect circuit boards and components for an excessive amount of dust deposited on them. Use a soft brush and low-pressure air stream to remove the dust.

CAUTION

Do not clean the circuit boards or small components with a stiff brush or solvents, since damage may result. A high-powered vacuum cleaner or air stream should not be used on small components.

Step 6. Clean the external surfaces of the unit with a soft, damp cloth to remove dirt, fingerprints, and other foreign materials.

Step 7. Reassemble the unit and reconnect power. Check performance. If performance does not equal or exceed the SPECIFICATIONS, corrective maintenance may be required.

CAUTION

The digital analyzer/controller includes CMOS devices which require special handling techniques to prevent irrepairable damage from static charges. Refer to the SAFE HANDLING OF CMOS INTEGRATED CIRCUIT DEVICES instruction section 68P81106E84.

5.2 BOTTOM CASE REMOVAL

Step 1. Disconnect ac power cable.

Step 2. Unscrew the 2 Phillips head screws on front panel until screws are disengaged.

Step 3. Position analyzer on end (handle up) and tip front panel down until it releases from case. See Figure 7.

Figure 7. Bottom Case Removal

Step 4. Position the unit face down on the work surface, using care to prevent damage to the power on/off switch, fuseholder, and BNC connectors.

Step 5. Disassemble the front panel support from the panel by removing the two # 6-32 locknuts.

Step 6. Lift the lower case by the handle to an upright position to gain access to the electrical assemblies.

Step 7. If desired, the lower case may be completely removed from the front panel by removing four # 4-40 locknuts from the case side of the hinge.

Step 8. To re-assemble the unit, reverse the above steps, observing the following precautions in the following steps:

Step 7. First, finger tighten the nuts on the hinge and center the front panel in the case. Tighten the nuts firmly, but do not over tighten.

Step 6. Return the lower case to a position where the front panel support bracket is aligned with the two #6-32 threaded studs.

Step 5. Do not over tighten the nuts (to avoid damaging the threaded studs).

5.3 CORRECTIVE MAINTENANCE

Due to the high degree of complexity of the R-1800A Digital Analyzer/Controller detailed troubleshooting procedures are not possible. Schematic diagrams, printed circuit board overlays, and complete parts lists are included as an aid to fault isolation and repair. If assistance is required, the Motorola Test Equipment Service Center may be contacted toll-free at 800-323-6967. Outside of the United States contact your Motorola Test Equipment Service Representative.

5.4 RETURNING EQUIPMENT TO FACTORY

5.4.1 General Information

Contact your nearest Motorola Parts and Service Depot prior to returning the digital analyzer/controller. Package the unit in the original container or follow the Packing Instructions given below. In either case, attach a tag to the unit indicating its model number and serial number, the name and address of the owner, and a summary of the service or repairs required.

5.4.2 Packing Instructions

Step 1. Wrap the unit in heavy paper or plastic prior to placing it into the shipping container.

Step 2. Use a strong carton or wooden box as the shipping container.

Step 3. Use an adequate layer of shock-absorbing material on all sides of the unit. Be certain that there is no movement of the unit within the shipping container.

Step 4. Seal the shipping container with strong tape or metal bands.

Step 5. Mark the shipping container "FRAGILE-DELICATE INSTRUMENT" to alert shippers that careful handling is required.

Step 6. Be certain that all correspondence refers to the unit's full model and serial numbers.

5.4.3 Parts and Service Address

National Accounts
1313 E. Algonquin Road
Schaumburg, Illinois 60196
Phone (312) 576-6509

SAFE HANDLING OF CMOS INTEGRATED CIRCUIT DEVICES

Many of the integrated circuit devices used in communications equipment are of the CMOS (Complementary Metal Oxide Semiconductor) type. Because of their high open circuit impedance, CMOS ICs are vulnerable to damage from static charges. Care must be taken in handling, shipping, and servicing them and the assemblies in which they are used.

Even though protection devices are provided in CMOS IC inputs, the protection is effective only against overvoltage in the hundreds of volts range such as are encountered in an operating system. In a system, circuit elements distribute static charges and load the CMOS circuits, decreasing the chance of damage. *However, CMOS circuits can be damaged by improper handling of the modules even in a system.*

To avoid damage to circuits, observe the following handling, shipping, and servicing precautions.

1. Prior to and while servicing a circuit module, particularly after moving within the service area, momentarily touch *both* hands to a bare metal earth grounded surface. This will discharge any static charge which may have accumulated on the person doing the servicing.

NOTE

Wearing Conductive Wrist Strap (Motorola No. RSX-4015A) will minimize static buildup during servicing.

2. Whenever possible, avoid touching any electrically conductive parts of the circuit module with your hands.

3. Normally, circuit modules can be inserted or removed with power applied to the unit. However, check the INSTALLATION and MAINTENANCE sections of the manual as well as the module schematic diagram to insure there are no objections to this practice.

4. When servicing a circuit module, avoid carpeted areas, dry environments, and certain types of clothing (silk, nylon, etc.) because they contribute to static buildup.

5. All electrically powered test equipment should be grounded. *Apply* the *ground lead* from the test equipment to the circuit module *before* connecting the *test probe*. Similarly, *disconnect* the *test probe prior* to removing the *ground lead*.

6. If a circuit module is removed from the system, it is desirable to lay it on a conductive surface (such as a sheet of aluminum foil) which is connected to ground through 100k of resistance.

WARNING

If the aluminum foil is connected directly to ground, be cautious of possible electrical shock from contacting the foil at the same time as other electrical circuits.

7. When soldering, be sure the soldering iron is grounded.

8. Prior to connecting jumpers, replacing circuit components, or touching CMOS pins (if this becomes necessary in the replacement of an integrated circuit device), be sure to discharge any static buildup as described in procedure 1. Since voltage differences can exist across the human body, it is recommended that only one hand be used if it is necessary to touch pins on the CMOS device and associated board wiring.

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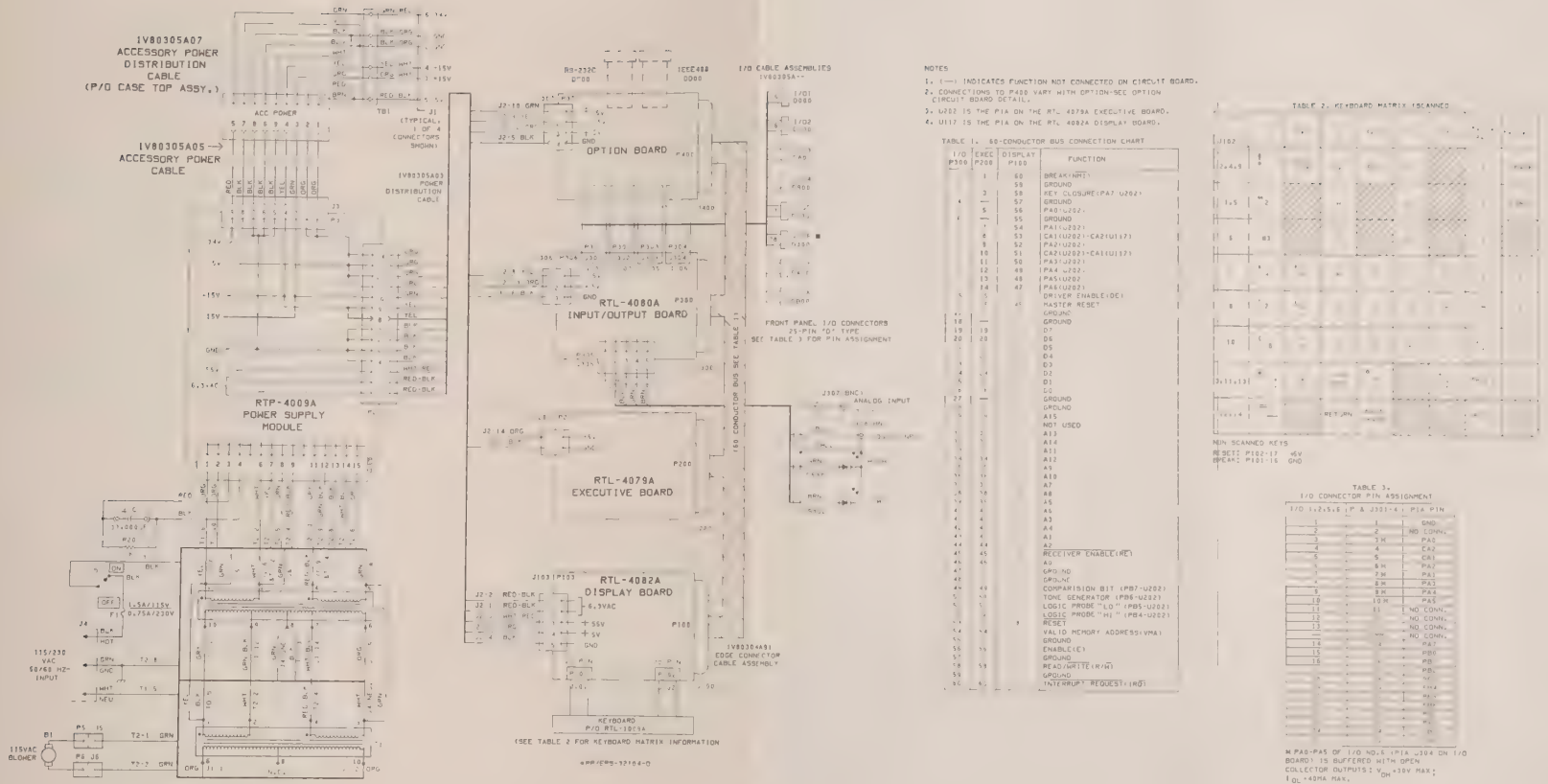
9. When replacing a CMOS integrated circuit device, leave the device in its metal rail container or conductive foam until it is to be inserted into the printed circuit module.

10. All low impedance test equipment (such as pulse generators, etc.) should be connected to CMOS device inputs after power is applied to the CMOS circuitry. Similarly, such low impedance equipment should be disconnected before power is turned off.

11. Replacement modules shipped separately from the factory will be packaged in a conductive material. Any modules being transported from one area to another should be wrapped in a similar material (aluminum foil may be used). NEVER USE NON-CONDUCTIVE MATERIAL for packaging these modules.



NOTES

1. (—) INDICATES FUNCTION NOT CONNECTED ON CIRCUIT BOARD.
2. CONNECTIONS TO P400 VARY WITH OPTION-SEE OPTION CIRCUIT BOARD DETAIL.
3. U202 IS THE PIA ON THE RTL 4079A EXECUTIVE BOARD.
4. U117 IS THE PIA ON THE RTL 4082A DISPLAY BOARD.

TABLE 1. 60-CONDUCTOR BUS CONNECTION CHART

I/O P300	EXEC P200	DISPLAY P100	FUNCTION
	1	60	BREAK(NMI)
		59	GROUND
	2	58	KEY CLOSURE(PA7 U202)
4	—	57	GROUND
	5	56	PA0(U202)
	—	55	GROUND
		54	PA1(U202)
	6	53	CA1(U202)-CA2(U117)
	7	52	PA2(U202)
	8	51	CA2(U202)-CA1(U117)
	11	50	PA3(U202)
	12	49	PA4 (U202)
	13	48	PA5(U202)
	14	47	PA6(U202)
5	—	46	DRIVER ENABLE(DE)
17	17	45	MASTER RESET
21			GROUND
18	—		GROUND
19	19		D7
20	20		D6
			D5
			D4
			D3
			D2
			D1
			D0
27	—		GROUND
			GROUND
			A15
			NOT USED
			A13
			A14
			A11
			A12
			A9
			A10
			A7
			A8
			A5
			A6
			A3
			A4
			A1
			A2
			RECEIVER ENABLE(RE)
			A0
			GROUND
			GROUND
			COMPARISION BIT (PB7-U202)
			TONE GENERATOR (PB6-U202)
			LOGIC PROBE "LO" (PB5-U202)
			LOGIC PROBE "HI" (PB4-U202)
			RESET
			VALID MEMORY ADDRESS(VMA)
			GROUND
			ENABLE(E)
			GROUND
			READ/WRITE(R/W)
			GROUND
			INTERRUPT REQUEST(IRQ)

TABLE 2. KEYBOARD MATRIX (SCANNED

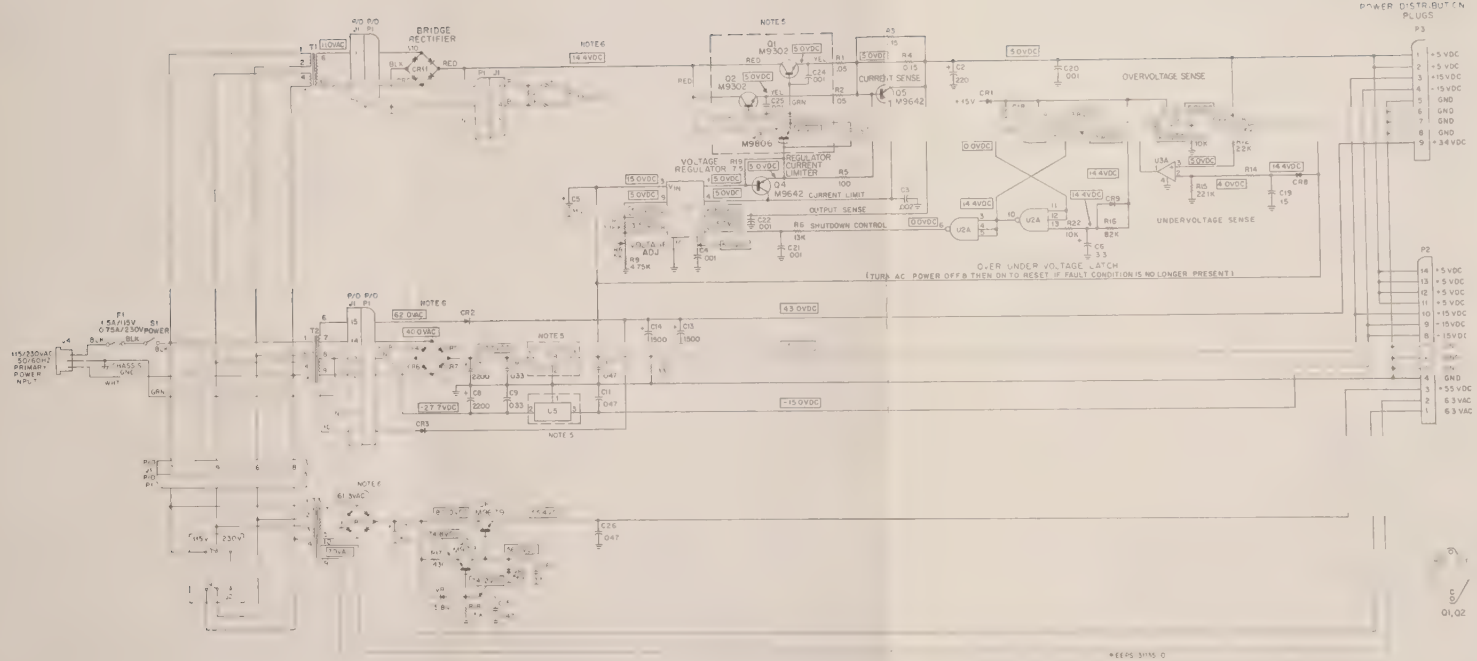
MIN SCANNED KEYS
RESET P102-17 +5V
BREAK P101-16 GND

TABLE 3.
I/O CONNECTOR PIN ASSIGNMENT

I/O 1x2x5x6 (P & J303-4) PIA PIN			
1	—	1	GND
2	—	2	NO CONN.
3	—	3 M	PA0
4	—	4	PA2
5	—	5	CA1
6	—	6 M	PA7
7	—	7 M	PA1
8	—	8 M	PA3
9	—	9 M	PA4
10	—	10 M	PA5
11	—	11	NO CONN.
12	—	—	NO CONN.
13	—	—	NO CONN.
—	—	—	NO CONN.
14	—	1	PA7
15	—	2	PB0
16	—	3	PB
	—	4	PB
	—	5	PB
	—	6	PB
	—	7	PB
	—	8	PB
	—	9	PB
	—	10	PB
	—	11	PB
	—	12	PB
	—	13	PB
	—	14	PB

* PA0-PA5 OF I/O NO.5 (PIA U304 ON I/O BOARD) IS BUFFERED WITH OPEN COLLECTOR OUTPUTS: V_{OH} +30V MAX; I_{OL} 40MA MAX.

R-1800A Intercabling Diagram
Motorola No. ***PEPS-32428-O***
7 21 81-SK



NOTES

1. Unless otherwise indicated resistor values are in ohms, capacitor values are in microfarads, and inductor values are in millihenries.
2. This diagram shows positive logic.

   Logic "1" 15 V dc
   Logic "0" 0 V dc

3. Some integrated circuits on this board are CMOS devices.
4. IC types and connections for this board are as follows:

Reference Designation	Type	VCC	Gnd	Mfgr's Description
U1	29M48	3	10	Adj Positive Volt Reg
U2	84L06	14	7	3 Input NAND Gate
U3	71K83	14	7	Dual Op Amp

5. Dashed area indicates heat sink mounted.
6. ⏚ Symbol indicates nominal dc voltages with respect to Gnd with power supply unloaded. All ac voltages are rms values measured across transformer secondaries with primaries at 115 V rms.

*PEPS-32135-O

RTP-4009A Power Supply Schematic Diagram and Circuit Board Detail W/Parts List
Motorola No. ***PEPS-32429-O***
(Sheet 1 of 2)
7/21/81-SK

parts list

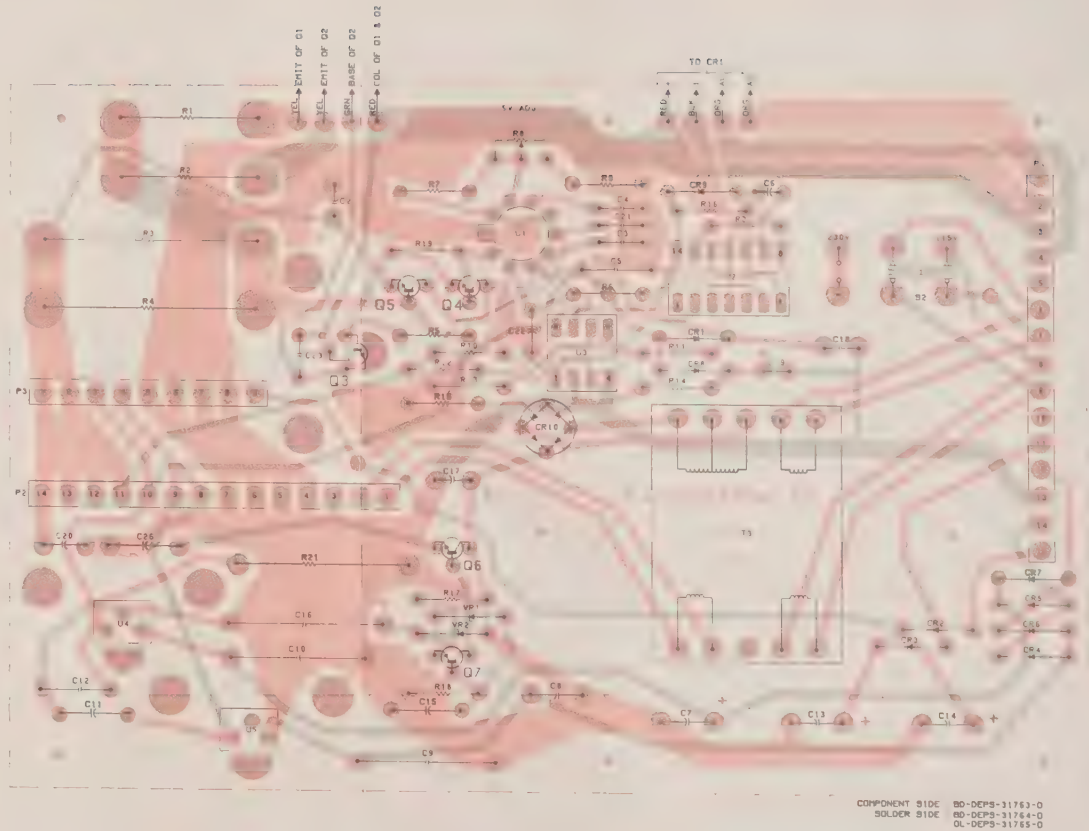
RTP-4009A Power Supply — PL-7371-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed
C1	23-80347A32	33000 uF 16V
C2	23-84665F06	220 uF + 150-10% 25 V
C3	21-82428B47	.002 uF ± 5% 200 V
C4	21-865923	.001 uF ± 10% 500V
C5	23-82783B26	1 uF ± 10% 35 V
C6	23-82397D26	3.3 uF ± 20% 20V
C7, 8	23-80347A65	2200 uF, 35 V
C9, 10	8-82096J21	0.33 uF ± 10%, 250 V
C11, 12	8-82096J04	.047 uF ± 10%, 250 V
C13, 14	23-80347A67	1500 uF, 50 V
C15	8-82096J04	.047 uF ± 10% 250 V
C16	23-82601A15	3 uF + 150-10% 100 V
C17	23-80347A66	150 uF, 100V
C18	23-84665F03	100 uF + 100-10% 32 V
C19	23-84665F02	15 uF + 100-10% 32 V
C20 thru 25	21-865923	.001 uF ± 10% 500 V
C26	8-82096J04	.047 uF ± 10% 250 V
		diode: (see note)
CR1 thru 7	48-82466M13	silicon
CR8, 9	48-83654H01	silicon
CR10	48-84621E08	bridge rectifier; 400 V
CR11	48-80347A68	bridge rectifier; MDA 2500
		connector, plug
P1	28-80327A14	male, 15 contact
P2	28-80327A13	male, 14 contact
P3	28-80327A08	male, 9 contact
		transistor (see note)
Q1, 2	48-869302	NPN, type M9302
Q3	48-869806	NPN, type M9806
Q4, 5	48-869642	NPN, type M9642
Q6	48-869679	NPN; type M9679
Q7	48-869713	PNP; type M9713
		resistor fixed; ± 5%; **1/4W;** unless otherwise stated
R1, 2	17-82036G49	.05, 2 W wire wound
R3, 4	17-80347A69	0.15 ± 1%, 5 W; wire wound
R5	6-124A25	100
R6	6-124A76	13k
R7	6-84444A39	3.16k ± 1%
R8	18-83452F11	variable 5k
R9	6-83175C97	4.75k ± 1%
R10	6-124A67	5.6k
R11	6-10621D09	15k ± 1%; 1/8 W
R12	6-124A81	22k
R13	6-83175C03	10k ± 1%
R14	6-83175C81	56.2k ± 1%
R15	6-83175C31	22.1k ± 1%
R16	6-124A95	82k
R17	6-124A40	430
R18	6-124A77	15k
R19	6-124B66	7.5
R20	6-125C49	1k ± 10%; 1/2 W
R21	6-127C37	330 ± 10%, 2 W
R22	6-124C73	10k ± 10%
		switch
S2	40-80347A97	slide; 115/230 V
		transformer
T3	25-80347A31	pri: 115/230 V ac sec #1 56 V ac sec #2 6.3 V ac
		integrated circuit (see note)
U1	51-83629M48	voltage regulator
U2	51-82884L06	triple 3-input "NAND" gate
U3	51-84371K63	dual operational amplifier
U4	51-83629M28	voltage regulator: +15 V
U5	51-83629M49	voltage regulator: −15 V
		voltage regulator (see note)
VR1	48-82256C61	Zener type, 5.8 V
VR2	48-84306A26	Zener type, 56 V

RTP 4009A Power Supply — PL-7371-O

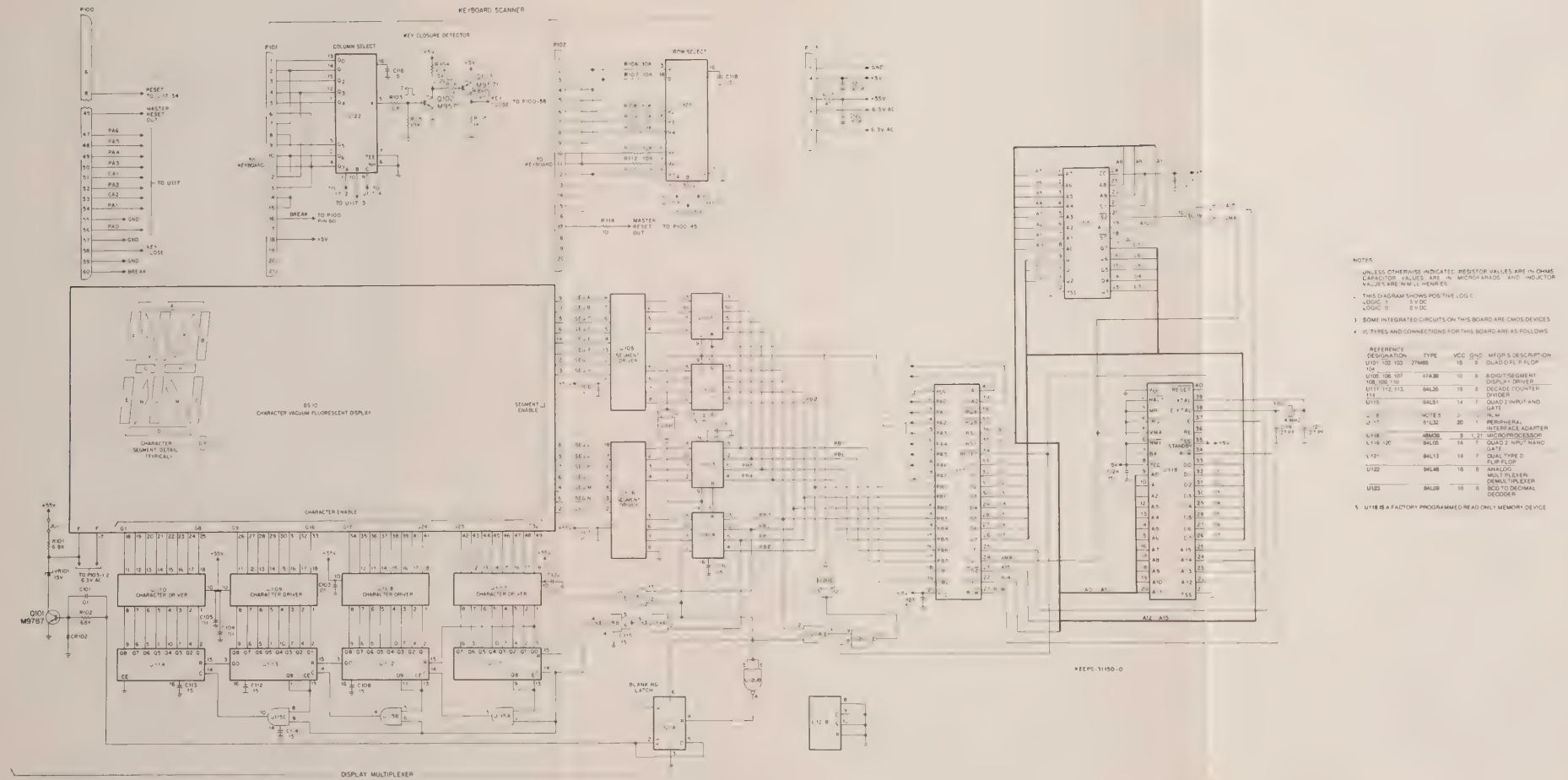
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		mechanical parts
	7-80326A75	HEATSINK, 3 used
	14-84391F01	INSULATOR transistor, 3 used
	3-2949	SCREW, masculine 6-32 x 5/16" , 2 used
	3-121841	NUT, 6-32 x 5/16 x 7/64" , 2 used
	3-138804	SCREW, masculine 4-40 x 5/16" , 3 used
	2-131435	NUT, 4-40 x 1/4 x 3/32" , 3 used
	4-84152B01	WASHER, shoulder, 3 used
	26-80347A07	HEATSINK
	14-866505	INSULATOR, 2 used
	9-80347A70	SOCKET, 2 used
	43-80347A90	STAND OFF, 6 used
	2-129892	NUT, 8-32 x 5/16 x 5/32"
	7-80347A08	BRACKET, mounting (right)
	7-80347A84	BRACKET mounting (left)
	3-124542	SCREW, machine, 6-32 x 3/4"
	3-1943	SCREW, machine, 4-40 x 5/16" , 2 used
	4-135285	LOCKWASHER, 2 used
	42-80313A70	TIE WRAP, 2 used
	4-51143	INSULATOR fibre, 2 used
	3-2294	SCREW, machine, 6-32 x 1/2" , 4 used

note For optimum performance, diodes, transistors, and integrated circuit must be ordered by Motorola part number



SHOWN FROM COMPONENT SIDE

RTP-4009A Power Supply Schematic Diagram and Circuit Board Detail W/ Parts List
Motorola No. PEPS-32429-O
(Sheet 2 of 2)
7-21-81-SK



NOTES

UNLESS OTHERWISE INDICATED RESISTOR VALUES ARE IN OHMS CAPACITOR VALUES ARE IN MICROFARADS AND INDUCTOR VALUES ARE IN MILLIHENRIES

1. THIS DIAGRAM SHOWS POSITIVE LOGIC
   - LOGIC 1 5 V DC
   - LOGIC 0 0 V DC
2. SOME INTEGRATED CIRCUITS ON THIS BOARD ARE CMOS DEVICES
3. IC TYPES AND CONNECTIONS FOR THIS BOARD ARE AS FOLLOWS

REFERENCE DESIGNATION	TYPE	VCC	GND	MFGR'S DESCRIPTION
U101 102 103 104	27M66	16	8	QUAD D FLIP FLOP
U105 106 107 108 109 110	47A30	10	8	BCD/7 SEGMENT DISPLAY DRIVER
U111 112, 113, 114	84L36	16	8	DECADE COUNTER DIVIDER
U115	84L51	14	7	QUAD 2-INPUT AND GATE
U116	NOTE 5	40	20	N-M
U117	81L32	20	1	PERIPHERAL INTERFACE ADAPTER
U118	68A09	8	1,21	MICROPROCESSOR
U119 U120	84L08	14	7	QUAD 2-INPUT NAND GATE
U121	84L13	14	7	DUAL TYPE D FLIP FLOP
U122	84L46	16	8	ANALOG MULTIPLEXER-DEMULTIPLEXER
U123	84L09	16	8	BCD TO DECIMAL DECODER

5. U118 IS A FACTORY PROGRAMMED READ ONLY MEMORY DEVICE

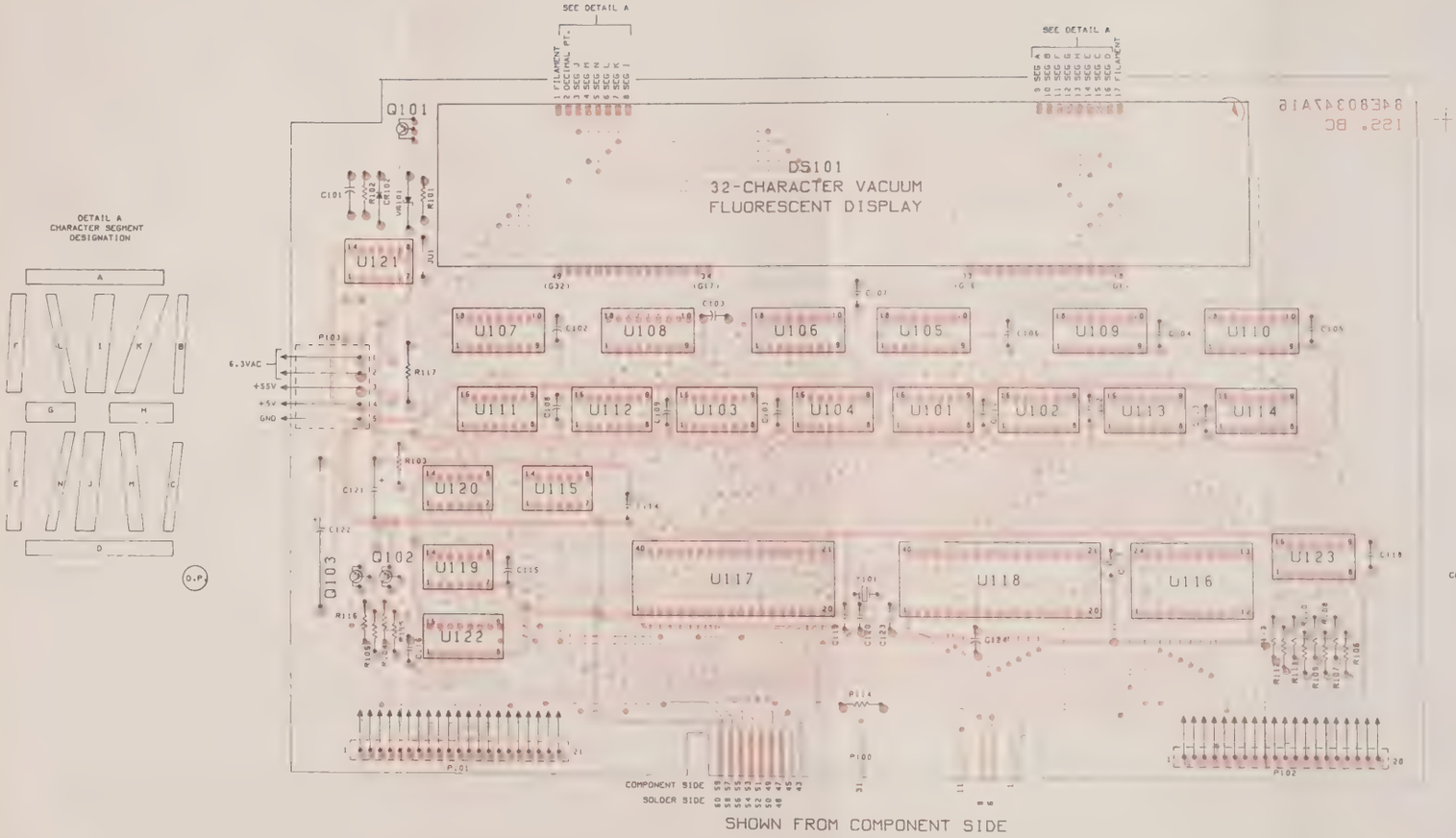
RTL-4082A Display Board Schematic Diagram and Circuit Board Detail W/Parts List
Motorola No. ***PEPS-32430-A***
(Sheet 1 of 2)
7/21/81-SK

parts list

RTL-4082A Display Board Kit PL-7385-O

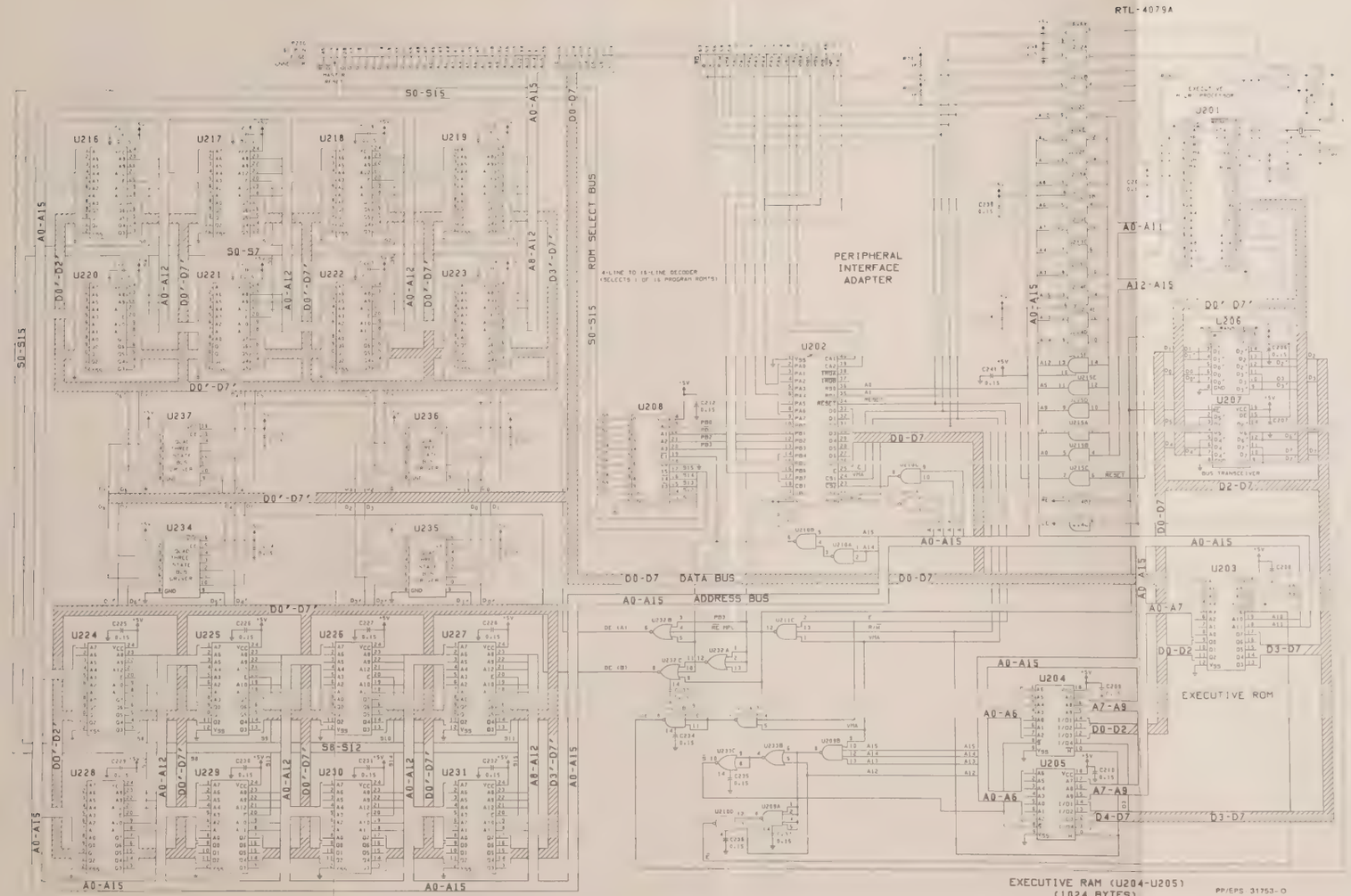
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C101 thru 107	21-82428B62	.01 uF + 80-20% 200 V
C108 thru 118	21-84008H03	0.15 uF + 80-20%, 50 V
C119, 120	21-84771	27pF ± 3% 300 V
C121	23-80348A60	100 uF + 100-0% 10 V
C122	23-82601A17	15 uF + 100-10% 150 V
C123, 124	21-84008H03	0.15 uF + 80-20%, 50 V
		diode: (see note)
CR101	48-82466H01	silicon
		light
DS101	97-80347A40	fluorescent, 32 char
		connector, plug
P101	28-80347A28	male, 21 contact
P102	28-80347A27	male, 20 contact
P103	28-80333A43	male, 5 contact
		transistor: (see note)
Q101	48-869787	NPN type M9787
Q102	48-869570	NPN type M9570
Q103	48-869571	PNP type M9571
		resistor, fixed: ± 5%; 1/4W; unless otherwise stated
R101, 102	6-124A69	6.8k
R103, 104	6-124A73	10k
R105	6-124A49	1k
R106 thru 113	6-124A73	10k
R114	6-124A01	10
R115, R116	6-124A73	10K
R117	6-125C17	47 ± 10%, 1/2W
		integrated circuit (see note)
U101 thru 104	51-83627M66	quad type D flip-flop
U105 thru 110	51-80347A39	display driver
U111 thru 114	51-82884L35	decode counter
U115	51-82884L51	quad 2-input "AND" gate
U116	51-80364A02	read only memory
U117	51-84561L32	peripheral interface adapter
U118	51-82848M39	microprocessor
U119, 120	51-82884L05	quad 2-input "NAND" gate
U121	51-82884L13	dual type D flip-flop
U122	51-82884L46	8-channel multiplexer
U123	51-82884L09	binary-to-octal decoder
		voltage regulator
VR101	48-82256C14	Zener type, 15 V
		crystal
Y101	48-80347A20	4 MHz
		mechanical parts
	9-80334A29	SOCKET, 40 contact, 2 used
	9-84881F01	SOCKET, 24 contact

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by motorola part numbers



COMPONENT SIDE 80-PP/EPS-32356-A
SOLDER SIDE 80-PP/EPS 32357-A
OL-DEPS-32081-A

RTL-4082 Display Board Schematic Diagram and Circuit Board Detail W/Parts List
Motorola No. ***PEPS-32430-A***
(Sheet 2 of 2)
7 21 81 SK



NOTES:

1. UNLESS OTHERWISE INDICATED:
   RESISTOR VALUES ARE IN OHMS
   CAPACITOR VALUES ARE IN MICROFARADS
   AND INDUCTOR VALUES ARE IN MILLIHENRIES

2. THIS DIAGRAM SHOWS POSITIVE LOGIC:

   LOGIC "1" 5VDC
   LOGIC "0" 0VDC

3. INTEGRATED CIRCUITS ON THIS BOARD ARE TTL AND CMOS DEVICES

4. IC TYPES AND [illegible] FOR THIS DIAGRAM ARE AS FOLLOWS:

REFERENCE				
U201	1820-[illegible]	40	1	MICROPROCESSOR
U202	6821	40	1	PIA
U203	6A4831	24	12	ROM
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
U208	74LS138	24	12	DECODER
U209	48M37	14	7	QUAD 4-INPUT NAND GATE
U210	27M07	14	7	QUAD 2-INPUT NAND GATE
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
U233	[illegible]	[illegible]	[illegible]	[illegible]
U234 THRU U237	27M68	16	8	BUS TRANSCEIVER

RTL-4079A Executive Board Schematic Diagram and Circuit Board Detail W Parts List
Motorola No. PEPS-32431-A
(Sheet 1 of 2)
7-21-81 SK

parts list

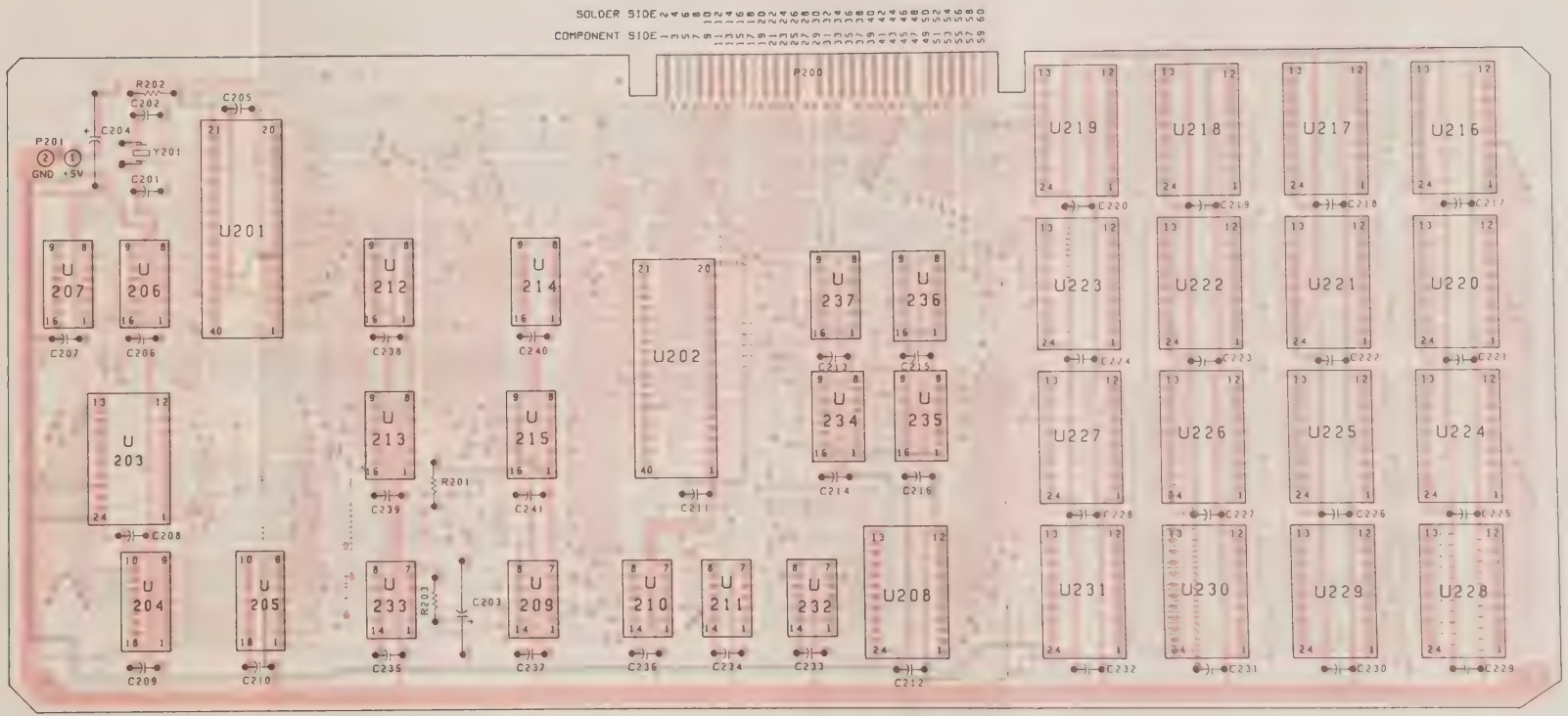
RTL 4079A Executive Board Kit — PL-7387-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C201, 202	21-847771	27pF ± 3% 300 V
C203	23-82601A01	25uF + 150-10% 25 V
C204	23-80348A60	100uF + 100-0% 10 V
C205 thru 241	21-84008H03	0.15uF + 80-20% 50 V
		connector, plug:
P201	28-80333A40	male, 2 contact
		resistor, fixed:
R201, 202	6-124A60	3k ± 5%, 1/4W
R203	6-124A49	1k ± 5%, 1/4W
		integrated circuit; (see note 1)
U201	51-80347A35	microprocessor
U202	51-84561L32	peripheral interface adapter
U203	51-80364A01	read only memory (executive)
U204, 205	51-82609M93	1024-word by 4-bit static RAM
U206, 207	51-83627M68	non-inverting quad three-state bus transceiver
U208	51-84371K38	4 line-to-16 line decoder
U209	51-82648M33	dual 4-input "NAND" gate
U210	51-83627M07	quad 2-input "NAND" gate
U211	51-82648M32	triple 3-input "NAND" gate
U212 thru 215	51-80347A36	hex three-state buffer inverters
U216 thru 231	See note 2	application program read only memory
U232	51-84371K16	triple 3-input "NOR" gate
U233	51-82648M29	quad 2-input "NOR" gate
U234 thru 237	51-83627M66	non-inverting quad three-state bus transceiver
		crystal
Y201	48-80347A20	4 MHz

mechanical parts

	45-80347A11	LEVER, actuator (with roll pin) 2 used
	9-84881F01	SOCKET, 24 contact, 15 used
	9-80347A42	SOCKET, 24 contact, 2 used
	9-80334A29	SOCKET, 40 contact, 2 used

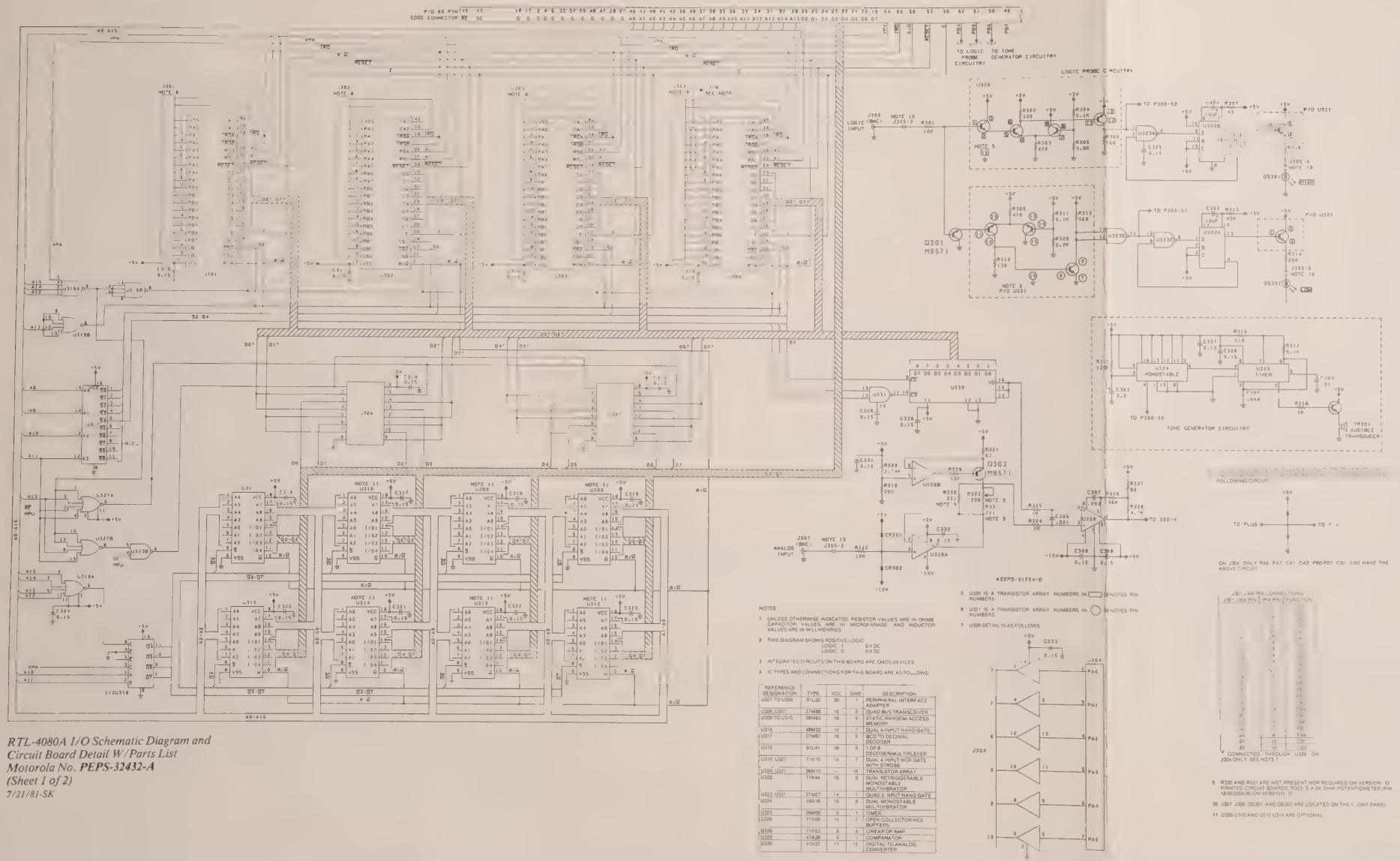
notes
1 For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.
2 Refer to Application Program Kit Instruction Section.



SHOWN FROM COMPONENT SIDE

COMPONENT SIDE PP/EPS-32312-A
SOLDER SIDE PP/EPS-32311-A
OL EEPS-32092-A

RTL-4079A Executive Board Schematic Diagram and Circuit Board Detail W/ Parts List
*Motorola No. **PEPS-32431-A***
(Sheet 2 of 2)
7 21 81-SK



RTL-4080A I/O Schematic Diagram and Circuit Board Detail W/Parts List Motorola No. ***PEPS-32432-A*** *(Sheet 1 of 2) 7/21/81-SK*

parts list

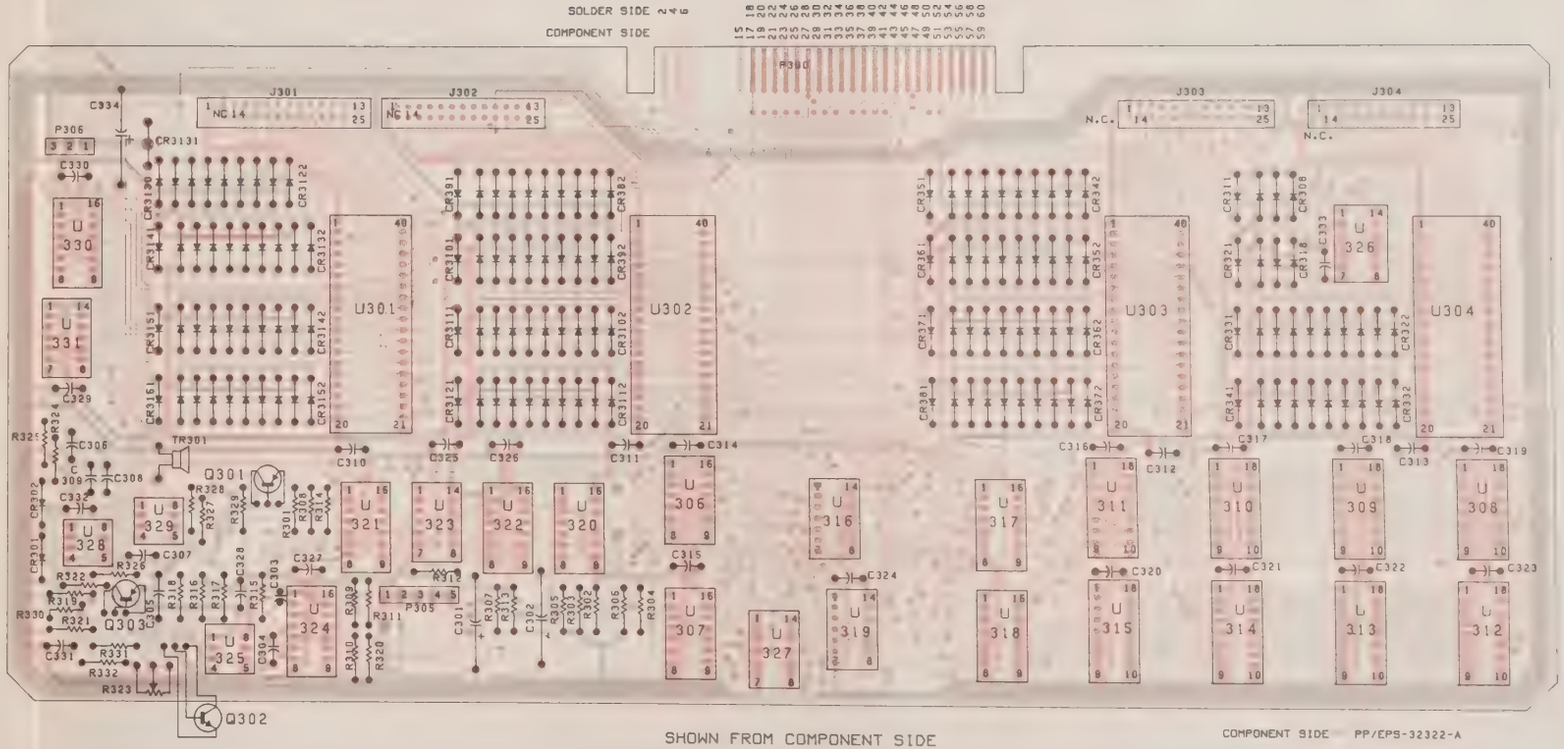
RTL-4080A I/O Board — PL-7366-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C301, C302	23-80348A62	10 uF, 20V
C303	23-82397D28	3.3 uF ± 20%; 20V
C304	21-82428B21	.01 uF + 10-30%; 100V
C305	8-82096J05	.06 uF ± 10%, 250V
C306	21-865923	.001 uF ± 10%, 500V
C307	21-837746	.002 uF ± 10%, 500V
C308 thru 333	21-84008H03	.015 uF ± 80-20%; 50V
C334	23-80348A60	100 uF + 100-20%; 50V
		diode (see note):
CR301, 302	48-82466H01	silicon
CR308 thru 311	48-82466H01	silicon
CR316 thru 399	48-82466H01	silicon
CR3100 thru 3161	48-82466H01	silicon
		light emitting diode: (see note):
DS301		p/o front panel
DS302		p/o front panel
TR301	1-80304A80	TRANSDUCER
		connector, receptacle:
J301, 302, 303, 304	28-80338A92	male, 25 contact
P305	28-80333A43	male, 5 contact
P306	28-80333A41	male, 3 contact
		transistor: (see note):
Q301	48-869571	PNP; type M9571
Q302	48-869570	NPN; type M9570
Q303	48-869571	PNP; type M9571
		resistor, fixed: ± 5%, 1/4W. unless otherwise stated
R301	6-124A73	10k
R302	6-124A37	330
R303	6-124A41	470
R304	6-124A66	5.1k
R305	6-124A60	3k
R306	6-124A43	560
R307	6-124A88	43k
R308	6-124A32	200
R309	6-124A41	470
R310	6-124A28	130
R311	6-124A66	5.1k
R312	6-124A43	560
R313	6-124A88	43k
R314	6-124A32	200
R315	6-124A89	120k
R316	6-124A42	510
R317	6-124A66	5.1k
R318	6-124A49	1k
R319	8-83175C27	20k ± 1%
R320	6-124A57	2.2k
R321	6-84444A56	82 ± 1%
R322	6-124A73	10k
R323	18-83452F05	variable, 200
R324, 325	6-124A49	1k
R326	6-124A86	36k
R327	6-124A23	82
R328	6-124A65	4.7k
R329	6-124A77	15k
R330	6-84444A10	2.74k ± 1%
R331, R332	6-10621B31	221 ± 1%
		integrated circuit (see note):
U301 thru 304	51-84561L32	peripheral interface adapter
U305		NOT USED
U306, 307	51-83627M68	non-inverting quad three-state bus transceiver
U308 thru 315	51-82609M93	1024-word by 4-Bit static RAM (See Note 2)
U316	51-82848M33	dual 4-input "NAND" gate
U317	51-8362M67	1 of 10 decoder
U318	51-84561L41	1 of 8 decoder
U319	51-84371K15	dual 4-input "NOR" gate
U320, 321	51-83629M10	transistor array
U322	51-84371K44	dual re-trig monostable
U323	51-83627M07	quad 2-input "NAND" gate
U324	51-80349A18	dual re-trig monostable
U325	51-83629M50	timer
U326	51-84371K08	open-collector hex buffers
U327	51-84371K15	dual 4-input "NOR" gate
U328	51-84371K63	dual operational amplifier
U329	51-80347A38	voltage comparator
U330	51-80347A37	D/A converter
U331	51-83627M07	quad 2-input "NAND" gate

RTL-4080A I/O Board — PL-7366-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		mechanical parts
	45-80347A11	LEVER, actuator (with roll pin)
	9-84881F06	SOCKET, 18 contact, 6 used
	9-84881F03	SOCKET, 40 contact, 4 used

note:
1. For optimum performance diodes, translators, and integrated circuits must be ordered by Motorola part number
2. U308-U310 and U312-U314 are optional



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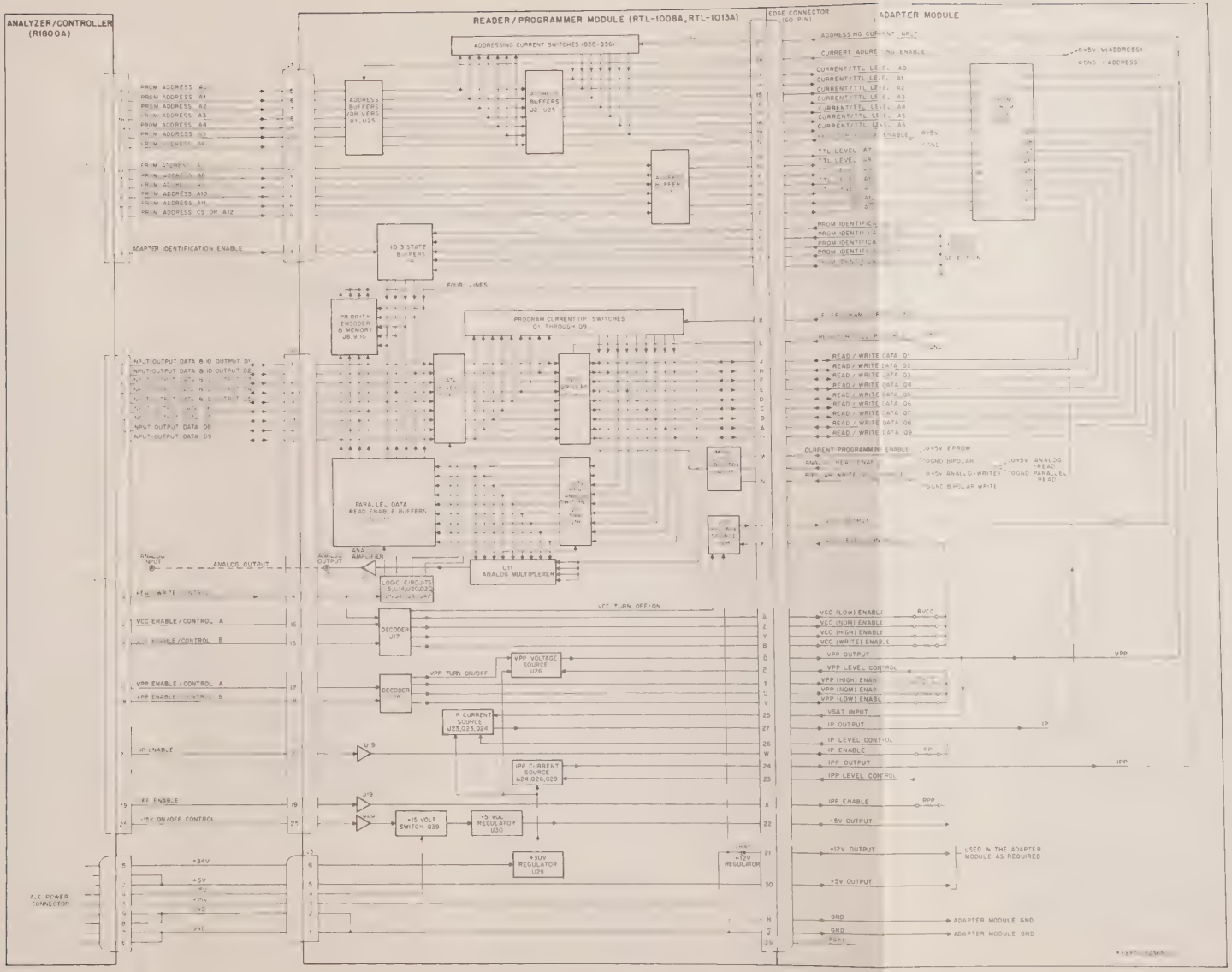
COMPONENT SIDE PP/EPS-32322-A

SOLDER SIDE PP/EPS-32323-A

OL EEPS-32093-A

RTL-4080A I/O Schematic Diagram and Circuit Board Detail W/ Parts List
Motorola No. ***PEPS-32432-A***
(Sheet 2 of 2)
7 21 81 SK



Reader/Programmer Functional Interconnect Diagram and Parts List
*Motorola No. **PEPS-32433-O***
(Sheet 1 of 2)
7 21 81 SK

parts list

RTL-4083A Main Circuit Board
RTL-4087A Main Circuit Board (Console) PL-7375-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed; uF
C1 thru 9	21-832501	.01 + 80-40%, 500 V
C10	8-829056-46	.022 ± 10%, 50 V
C11, 12, 13, 14	23-82783B08	1 ± 20%, 35 V
C15	8-82905G11	0.22 ± 10%, 50 V
C16, 17	23-82783B08	1 ± 20%, 35 V
C18	21-832501	.01 + 80-40%, 500 V
C19, 20	21-840713	120pF ± 5%; 500 V
C21, 22, 23	23-82783B08	1 ± 20%, 35 V
C24 thru 30	21-832501	.01 + 80-40%, 500 V
C32 thru 34	21-832501	.01 + 80-40%, 500 V
C36 thru 44	21-832501	.01 + 80-40%, 500 V
C45	21-83798B17	100pF ± 5% (NPO) (ceramic)
		diode: (see note)
CR1 thru 9	48-84616A01	hot carrier
CR10 thru 18	48-83654H01	silicon
CR19 thru 27	48-82466H13	silicon
CR28 thru 38	48-83654H01	silicon
CR39	48-82466H13	silicon
CR40	48-83654H01	silicon
CR41	48-82466H13	silicon
CR42, 43	48-83654H01	silicon
CR46	48-83654H01	silicon
CR49 thru 53	48-82466H01	silicon
CR54 thru 67	48-83654H01	silicon
CR68 thru 74	48-84616A01	hot carrier
CR77	48-82466H13	silicon
CR78 thru 93	48-84616A01	hot carrier
CR94	48-83654H01	silicon
		connector, receptacle
J1, 2	9-80347A53	female 25 contact "D"
J1, J2	9-80349A61	female 25 contact "D" on (RTL-4087A)
J3	28-80333A44	male 6 contact (molex)
J4	9-84231B02	female, phono jack
		transistor (see note)
Q1 thru 9	48-869707	PNP Darlington
Q10 thru 18	48-84308A43	field-effect
Q19, 20, 21	48-869642	NPN; type M9642
Q22	48-869582	PNP, type M9582
Q23	48-869348	PNP, type M9348
Q24, 25	48-869661	NPN, type M9661
Q26	48-869348	PNP, type M9348
Q27	48-869642	NPN, type M9642
Q28	48-84308A43	field-effect
Q29	48-869661	NPN, type M9661
Q30 thru 36	48-869681	PNP; type M9681
Q37, 38, 39	48-869642	NPN, type M9642
Q40	48-869681	PNP; type M9681
Q41	48-869642	NPN, type M9642
Q42	48-869681	PNP; type M9681
		resistor, fixed: ± 5%; 1/4W; unless otherwise stated
R1 thru 18	6-124A73	10k
R19 thru 27	6-124A65	4.7k
R28 thru 36	6-124B32	2.7 meg
R37	6-124A49	1k
R38	6-124A59	2.7k
R39 thru 44	6-124A73	10k
R45	6-124A59	2.7k
R46	6-124A45	680
R47	6-80334A66	237 ± 1%
R48	6-124A59	2.7k
R49	6-124A89	47k
R50	6-124A59	2.7k
R51	6-124A89	47k
R52	6-80334A66	237 ± 1%
R53	6-124A39	390
R54	6-124A65	4.7k
R55	6-126A17	47; 1 W
R56	6-124B32	2.7 meg
R57	6-124B22	1 meg
R58	6-124A66	5.1k
R59	6-124B10	330k
R60	6-124A83	27k
R61	6-124A97	100k
R62	6-124A77	15k
R63	6-124A81	22k
R64 thru 66	6-124A73	10k
R67	6-124A49	1k
R68	6-124A57	2.2k
R69	6-124B22	1 meg
R70, 71	6-124A73	10k
R72	6-124A65	4.7k
R74	6-127A01	10; 2 W
R75	6-127A05	15, 2 W

RTL 4083A Main Circuit Board
RTL-4087A Main Circuit Board (Console) PL-7375-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R76	6-124A65	4.7k
R77	6-124A25	100
R78	6-80334A65	10k ± 1%
R79	6-124A31	180
R80	6-124A57	2.2k
R81	6-124B22	1 meg
R82	6-124A65	4.7k
R83	6-124A25	100
R84	6-80334A65	10k ± 1%
R85	8-127A20	62; 2 W
R86	6-124A31	180
R87	6-124A57	2.2k
R88 thru 94	6-124A65	4.7k
R95 thru 101	6-124A65	4.7k
R102	6-80333A66	237 ± 1%
R103	6-80334A67	5.47k ± 1%
R104	18-83083G15	variable, 100
R105	18-83083G28	variable, 1k
R106	18-83083G15	variable, 100
R107 thru 129	6-124A73	10k
R130, 131	6-124A35	270
R132	6-124A61	3.3k
R133, 134	6-124A91	56k
R135	6-124A71	8.2k
R136	6-124A61	3.3k
R137	6-124A89	47k
R138	6-124A97	100k
R139	6-124A57	2.2k
R140	6-124A65	4.7k
		integrated circuit (see note)
U1, 2	51-84371K07	hex inverter
U3	51-82884L01	hex buffer
U4	51-83627M64	hex buffer 3-State
U5, 6, 7	51-84371K07	hex inverter
U8	51-83627M85	priority encoder
U9,10	51-82884L45	quad R-S latch
U11	51-82884L46	analog multipexer
U12,13	51-84561L77	buffer TTL
U14	51-84561L06	quad dual "NOR" gate
U15	51-84561L04	quad dual "NAND" gate
U16	51-82884L02	hex inverter
U17	51-84561L41	binary to octal decoder
U18	51-84561L42	dual binary
U19,20	51-84371K08	hex buffer
U21	51-83629M15	operational amplifier
U22,23,24	51-84371K60	operational amplifier
U25	51-84371K07	hex inverter
U26	51-80347A76	voltage regulator
U27	51-82609M20	−5 V volt regulator
U28,29	51-82848M49	+5-18 V volt regulator
U30	51-82848M16	−5 V volt regulator
U31	51-80345A99	resistor network (100k x 5)
		voltage regulator (see note)
VR44	48-83461E01	Zener, 16 V
VR45	48-83461E03	Zener, 3.3 V
VR47,48	48-82256C12	Zener, 5.6 V
VR75,76	48-82256C12	Zener; 5.6 V
		mechanical parts
	7-80347A64	BRACKET, 2 used
	43-80347A55	BUSHING, shoulder, 4 used
	3-136890	SCREW, machine, 4-40 x 9/16" (w/lck wshr) 10 used
	1-80304A99	MAIN board assembly includes
	43-83066F02	NUT, 4-40, stakes, 8 used

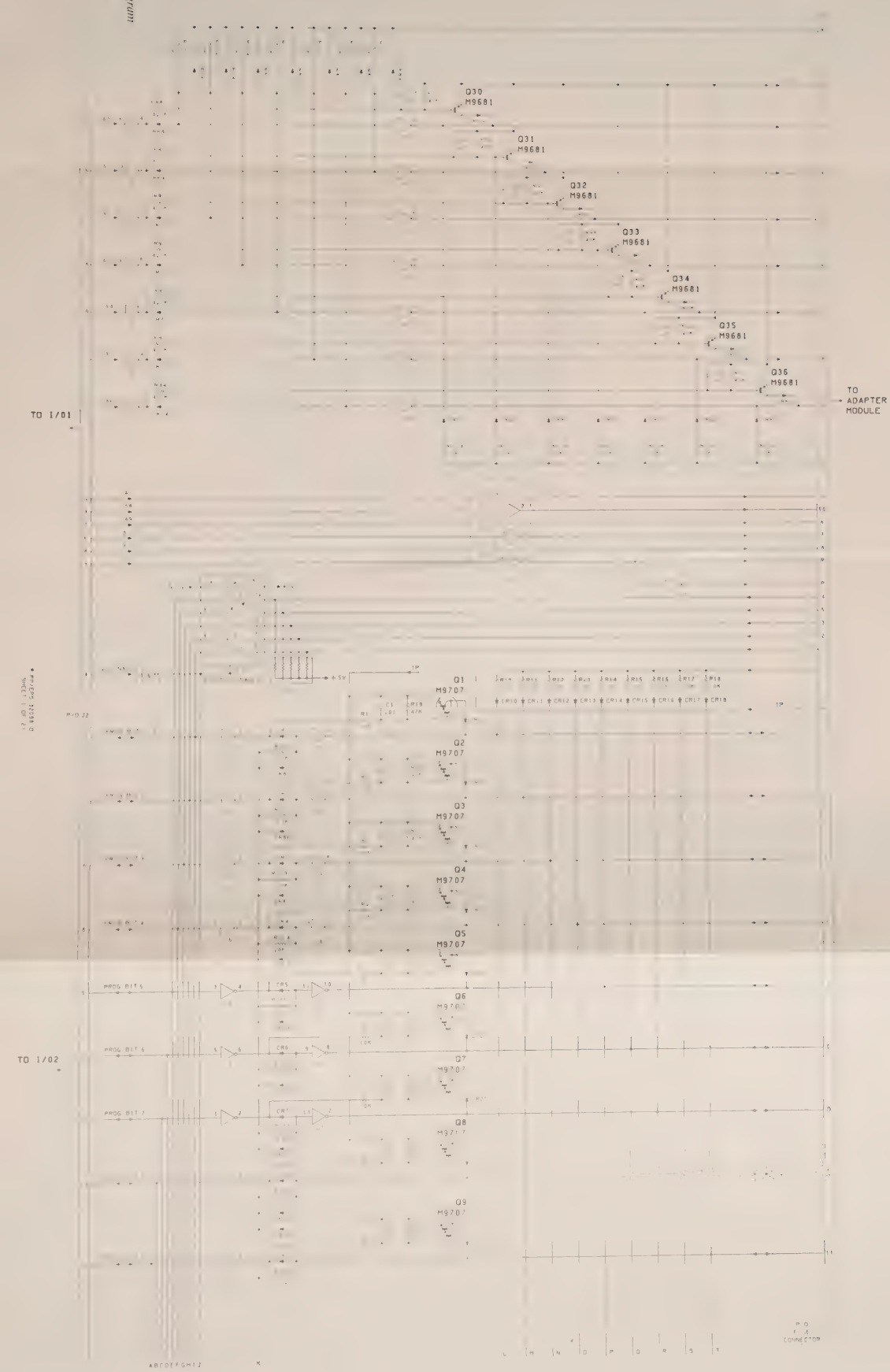
note: For optimum performance, diodes, transistors, and integrated circuit must be ordered by Motorola part number

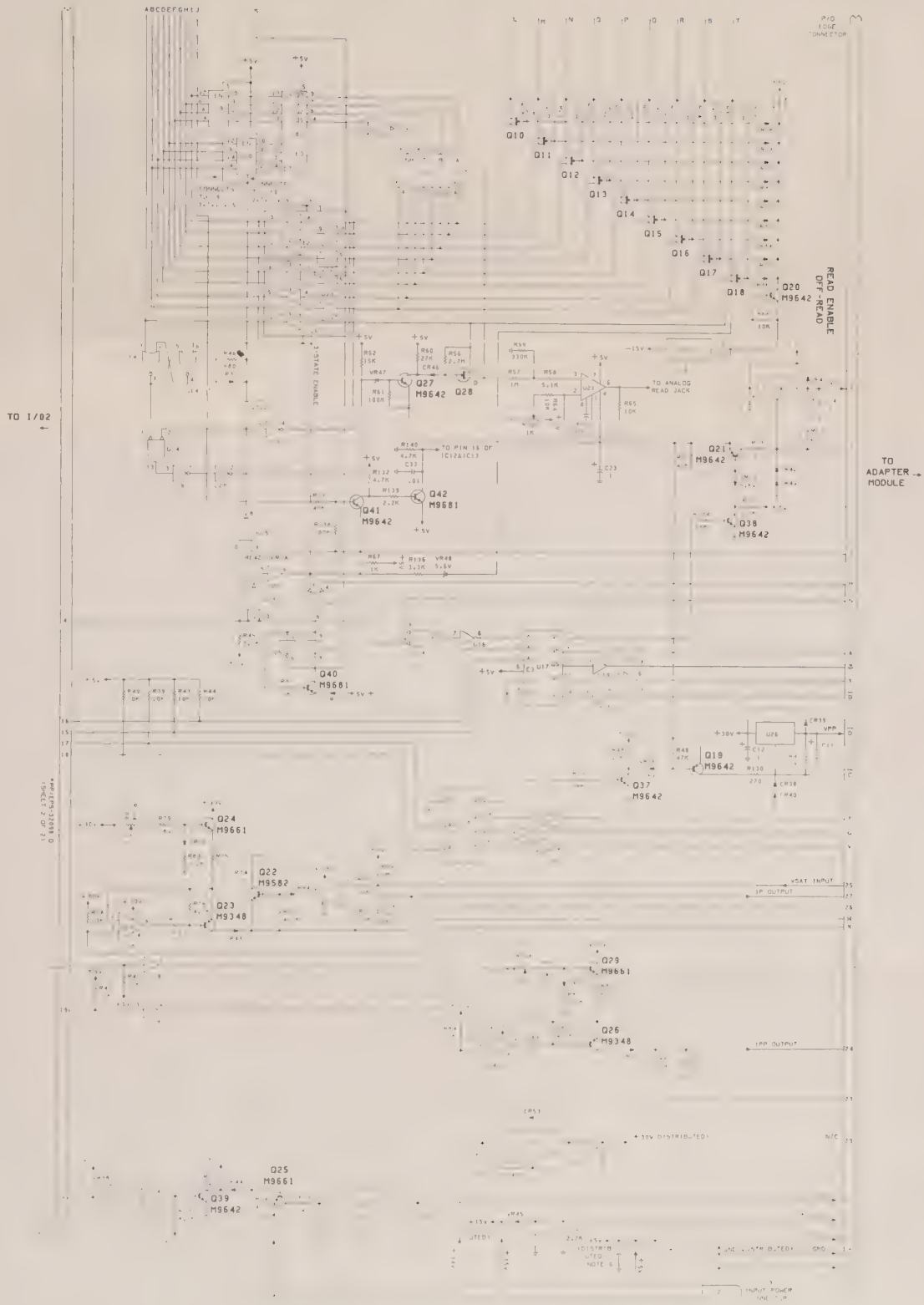
RTL 1008A Reader/Programmer Kit
RTL 1013A Reader/Programmer Kit (Console) PL-7418-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		connector, receptacle
J5	9-855268	female, single contact (BNC)
	28-844878	male, single contact (BNC) (RTL 1013A)
		connector, plug
P4	28-82331G01	male, single contact
		mechanical parts
	64-80347A50	PANEL, back
	43-10646A04	BUSHING, threaded 10 used
	43-80347A54	BUSHING, spacer, 4 used
	3-136890	SCREW, machine, 4-40 x 9/16" (w/lck wshr) 10 used
	29-5237	LUG, solder
	1-80304A97	FRONT PANEL ASSEMBLY, includes,
	1-80305A47	FRONT PANEL ASSEMBLY, (on RTL-1013A)
	64-80347A48	PANEL FRONT
	64-80349A39	PANEL FRONT (on RTL 1013A)
	45-82233D02	STUD 4 used
	4-82234D01	WASHER captive, 4 used
	1-80304A98	CABLE ASSEMBLY
	30-840807	COAXIAL CABLE, 7" refer J5, P4
	30-475378	COAXIAL CABLE, 10" (RTL-1013A)
	1-80301A99	MAIN BOARD (stake)
	4-10058B19	WASHER, FIBER, 10 used
	43-80349A62	BUSHING SHOULDER (on RTL-1013A)
	43-80349A63	BUSHING SPACER (on TRL-1013A)
	21-80308A59	CABLE ASS'Y (I/O) 2 used (RTL 1013A)
	1-80305A48	CABLE ASS'Y (analog) 1 used (RTL 1013A)

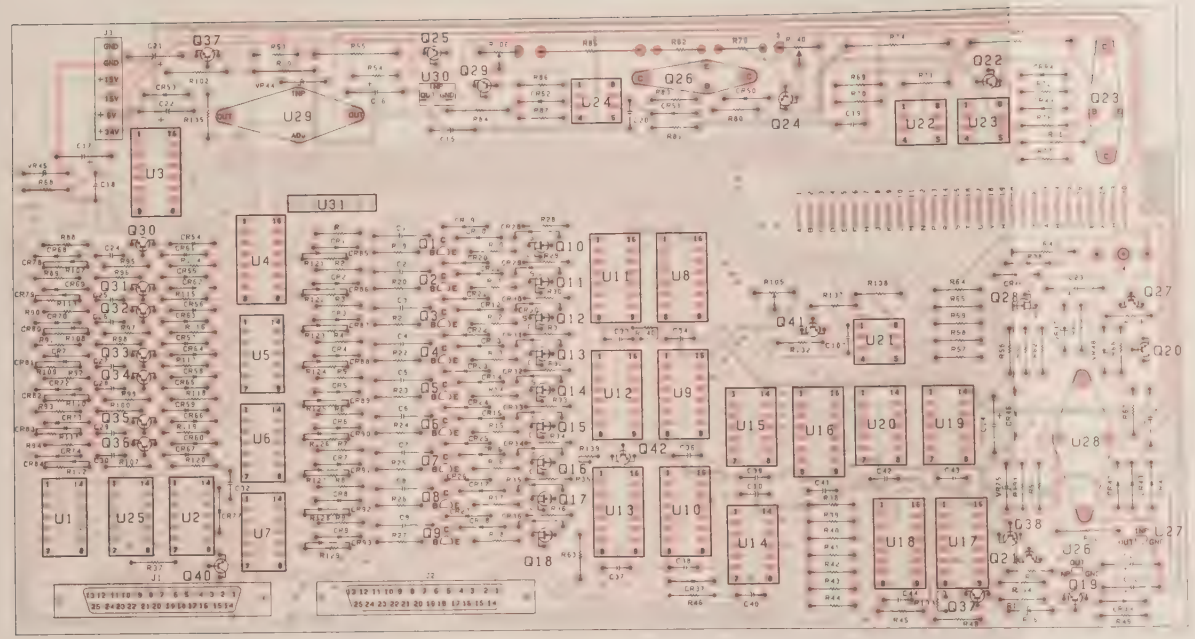
Reader/Programmer Functional Interconnect Diagram and Parts List
Motorola No. PEPS-32433-O
(Sheet 2 of 2)
7-21-81-SK

Reader Programmer Schematic Diagram and Circuit Board Detail
Motorola No. PEPS-32434-4
(Sheet 1 of 3)
7-21-81 SA





Reader/Programmer Schematic Diagram and Circuit Board Detail
Motorola No. PEPS-3244-A
(Sheet 2 of 3)
7/21/81-SK



SHOWN FROM COMPONENT SIDE

COMPONENT SIDE — BD-PP/EPS-32363-A
SOLDER SIDE — BD-PP/EPS-32364-A
DL — DB-PP/EPS-32221 A

Reader/Programmer Schematic Diagram
and Circuit Board Detail
Motorola No. ***PEPS-32434-A***
(Sheet 3 of 3)
7/21/81-SK

parts list

1-80304A93 Case, Test Set — PL-7372-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	1-80305A21	CASE, test set (riveted assembly)
	1-80305A20	FRAME, cover
	1-80305A07	ACCESSORY Power Distribution Cable, includes:
P1,2,3,4	15-80327A25	HOUSING, connector, female; 4 used
	29-83499F01	CONTACTS; 24 used
ACC PWR	15-80347A72	HOUSING, connector male; 9 contact
	29-80347A95	CONTACTS: 9 used
	1-80308A56	HOUSING, connector (with mtg hdwr)
	1-80305A19	PANEL, blank (3 inch), includes 1/4-turn fasteners
	55-80348A52	LATCH (plunger)
	55-80348A53	LATCH (grommet)
	55-80347A61	HINGE
	64-80347A46	DOOR, accessory compartment
	7-80347A45	BRACKET; 2 required
	42-80313A70	TIE WRAP; 3 required
	2-131435	NUT, lock: 4-40; 6 required
	2-132616	NUT, lock: 6-32; 4 required
	3-136890	SCREW, machine: 4-40 x 1/4"; 12 required

1-80305A25 I/O Cable Assembly #1 — PL-7376-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		connector receptacle
I/O 1	9-80347A21	female: 25 contact
P301	9-80347A25	female; 26 contact
		mechanical part
	30-80347A79	CABLE, ribbon; 25 conductor; 18 3/4" raised

note: Field repair of I/O cable assembly is not recommended. Entire cable assembly should be ordered when replacement is necessary.

1-80305A26 I/O Cable Assembly #2 — PL-7377-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		connector receptacle
I/O 2	9-80347A21	female: 25 contact
P302	9-80347A25	female; 26 contact
		mechanical part
	30-80347A79	CABLE, ribbon; 25 conductor; 19 3/4" used

note: Field repair of I/O cable assembly is not recommended. Entire cable assembly should be ordered when replacement is necessary.

1-80305A25 I/O Cable Assembly #3 — PL-7378-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		connector receptacle
I/O 5	9-80347A21	female: 25 contact
P303	9-80347A25	female; 26 contact
		mechanical part
	30-80347A79	CABLE, ribbon; 25 conductor; 21" used

note: Field repair of I/O cable assembly is not recommended. Entire cable assembly should be ordered when replacement is necessary.

1-80305A28 I/O Cable Assembly #4 — PL-7379-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		connector receptacle
I/O6	9-80347A21	female: 25 contact
P304	9-80347A25	female; 26 contact
		mechanical part
	30-80347A79	CABLE, ribbon; 25 conductor; 19 1/4" raised

note: Field repair of I/O cable assembly is not recommended. Entire cable assembly should be ordered when replacement is necessary.

1-80305A05 Accessory Power Cable Assembly — PL-7380-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		connector receptacle
ACC PWR	15-80347A22	HOUSING, connector; female; 9 contact
J3	15-80327A28	HOUSING, connector; female; 9 contact
		mechanical parts
	29-80347A96	CONTACT, 9 used (15-80347A22 housing)
	29-83499F01	CONTACT; 9 used (15-80327A28 housing)
	42-80313A70	TIE WRAPS; 2 used

1-80304A90 Card Cage Assembly — PL-7381-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor fixed:
C1	23-80347A32	33000 μF; 16V
		connector assembly
J100,200,300, 400	1-8034A91	Cable assembly includes:
	9-80347A23	CONNECTOR, female; 60 contact edge 4 used
	30-80347A78	CABLE, ribbon 60 conductor 10 1/4"
		mechanical parts
	1-80305A02	Card cage assembly (riveted), includes:
	46-80347A12	GUIDE, Card; 6 used
	2-131435	NUT, lock; 4-40 x 1/4 x 3/32"; 14 used
	3-8022	SCREW, machine: 4-40 x 1/4"; 2 used
	4-7607	WASHER, flat; 6 used
	42-80347A63	RETAINER, ribbon cable; 2 used
	42-80349A59	RETAINER, p.c. board

1-80305A04 Cable Logic Probe — PL-7382 O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		connector, plug:
J305	15-80327A24	FEMALE: 5 contact
	29-83499F01	LUG, crimp: 5 used
	30-84091A01	CABLE, shielded 3 conductor;
	30-840807	CABLE, coaxial

1-80305A03 Power Distribution Cable Assembly — PL-7383-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		connector receptacle
J2	15-80327A33	HOUSING, connector, female; 14 contact
J103	15-80327A24	HOUSING, connector, female; 5 contact
J201	15-80327A21	HOUSING, connector, female; 2 contact
J306	15-80327A22	HOUSING, connector, female; 3 contact
J307	15-80327A23	HOUSING, connector, female; 4 contact
		mechanical part
	29-83499F01	Contact; 28 used
	42-80313A70	TIE WRAPS; 5 used

Digital Analyzer/Controller
Front Panel Assembly Parts List
Motorola No. ***PEPS-32992-O***
(Sheet 1 of 2)
7/21/81-SK

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		blower:
B1	59-80347A19	motor, fan
		light emitting diode:
DS301, 302	48-88245C04	red
		fuseholder:
	9-84283L01	Bayonet style, fuse extractor type
		fuse
F1	65-890033	1.5 amp (100-130 V applications)
	or 65-898635	0.75 amp (200-260 V applications)
		connector, receptacle:
J1	15-80327A34	housing, connector; 15 contact
J4	9-82393K02	female; 3 contact (AC plug)
P5,6	14-83799G02	housing, connector, female; single contact
J307, 308	9-855268	female, single contact (BNC)
		connector, plug:
J5, 6	14-83799G01	HOUSING, connector male; single contact
		resistor, fixed:
R20	6-125A49	1k ± 10%; 1/2w
		switch:
S1	40-80347A05	spst
		transformer:
T1	25-80347A29	pri: 115/230 Vac; sec sec: 10 V C.T.
T2	25-80347A30	pri: 115/230 Vac sec: 56 V C.T.
		mechanical parts
	1-80308A54	FRONT PANEL WITH KEYBOARD ASSEMBLY
	43-80347A91	STAND OFF; 4 used (display board)
	55-80347A61	HINGE
	29-5237	LUG, 2 used (BNC)
	64-80347A81	PLATE, blank (I/O): 5 used
	7-80347A82	PLATE, blank (IEEE)
	64-80347A99	BRACKET, transformer mounting (T2) 4 used
	7-80347A83	BRACKET, transformer mounting (T1) 4 used
	3-80349A65	SCREW, machine; 6-32 x 9/16"; 4 used
	3-80349A66	SCREW, machine; 6-32 x 1 5/16"; 4 used
	2-121841	NUT, lock; 6-32: 28 used
	2-131435	NUT, lock; 4-40 x 1/4 x 3/32"; 31 used
	2-9627	NUT, 4-40 x 3/16 x 3/32"; 10 used
	4-7683	LOCKWASHER #4: 10 used
	13-80347A85	BEZEL, front panel
	42-82143C02	CLAMP, Cable: 1/4"; 2 used
	42-82143C03	CLAMP, Cable: 1/8"
	29-868310	LUG, spade (ground)
	39-10184A02	CONTACT, male; 2 used: P/O P5 and P6
	39-10184A01	CONTACT, female; 2 used: P/O J5 and J6
	29-83499F01	TERMINAL, pin; 13 used
	29-5248	LUG, solder; 2 used (C1)
	42-80313A70	TIE WRAPS; 8 used
	15-80347A10	HOUSING, blower
	35-80349A76	BAFFLE, blower
	35-80349A77	BAFFLE, blower
	3-7229	SCREW, machine: 6-32 x 3/8"; 8 used

Digital Analyzer/Controller
Front Panel Assembly Parts List
Motorola No. ***PEPS-32992-O***
(Sheet 2 of 2)
7/21/81-SK

INSTRUCTION
MANUAL
REVISION

Supersedes smr-4323

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual. IMPORTANT NOTE: Self-Test and calibration instructions are included in this revision.

INSTRUCTION MANUAL AFFECTED:

68P81069A90-0 and -A DIGITAL ANALYZER/CONTROLLER
R-1800A Instruction Manual

REVISION DETAILS:

1. On PEPS - 32429, RTP - 4009A Power Supply Schematic Diagram and Circuit Board Detail, a capacitor (P/N 23-83397D26; 0.47 mfd ± 20%, 35V) has been added at the input of integrated circuit U3B, between pin 5 and ground, across resistor R13.

2. On PEPS - 32434, Reader/Programmer Schematic Diagram and Circuit Board Detail, capacitor C11 (1mfd) has been omitted. Several additional component changes are tabulated below.

Revisions to parts list PL-7375-0

RTL-4083A Main Circuit Board
RTL-4087A Main Circuit Board (Console)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
Q24,29	48-869712	transistor, NPN: Darlington
R80,87	6-124A64	resistor, fixed: 4.3K ±5%; ¼W
R57	6-10621E85	resistor, fixed: 1M ±1%; 1/8W
R59	6-10621E39	resistor, fixed: 332K ±1%; 1/8W
R64,65	6-10621C91	resistor, fixed: 10K ±1%; 1/8W
C13,17,22	8-82905G27	capacitor, fixed: 0.1mfd ±10%; 50V

3. On PEPS - 32434, Reader/Programmer Circuit Board Detail (Sheet 3 of 3), a connection has been added between integrated circuit U11 pin 8 (ground) and U11 pin 7.

4. On PEPS - 32431, RTL-4079A Executive Board Schematic Diagram and Circuit Board Detail, a capacitor (P/N 21-82187B08;220pF ±10%, has been added at the output of integrated circuit U233D, between pin 13 and +5V.

5. Pg. 9, Section 4. OPERATION
Paragraph 4.3 is added to provide supplementary operating and self test instructions:

4.3 SUPPLEMENTARY OPERATING INSTRUCTIONS

4.3.1 Program List

Through keyboard entry it is possible to command the DA/C to display the name of each program installed in the application ROM sockets. This feature can be used to verify the presence of a program or the exact name of a program. This mode can be entered only at the executive prompt: "ENTER PROGRAM NAME__". At this point enter "\L" ("Shift L"and L) followed by RETURN. Each program located will be displayed for about 1 second, and then the display will revert to: "ENTER PROGRAM NAME__". If a particular program is not located check for proper ROM installation (see paragraph 3.2).

4.3.2 Self-Test

Each time the Digital Analyzer/Controller is powered on, or whenever the RESET key is depressed, the executive program performs a limited self-test sequence, primarily verifying the executive-display board interface, the executive ROM (program), and the RAM.

This test takes approximately 4 seconds. Successful completion is indicated by a beep from the annunciator and a display of the user RAM capacity: "1K RAM ON BOARD" (or "4K" with expanded memory option). The display then continues through the identification and copyright messages. Note that automatic self-test is bypassed when the BREAK key is depressed.

If faults are detected in RAM or ROM a failure message will be displayed, assuming the failure is such that the ability to display is not affected. If the executive-display board interface is defective the annunciator will beep continuously. Display messages are explained in the following paragraphs.

Additional tests may be accessed manually to verify operation or assist in fault isolation. Refer all repairs to the Motorola Test Equipment Service Center. Self-test is divided into four areas: display, keyboard, executive board, and I/O board. To enable the self-test mode, following the "ENTER PROGRAM NAME__" prompt, enter "\T" ("Shift L" and T) followed by RETURN. The display will return with the prompt "SELECT TEST".

4.3.2.1 Display Test

When prompted to select test, enter "1". The display will return with: "DISPLAY TEST" followed by "SELECT MODE". By entering "1" an automatic sequence will be initiated. "2" will select a manual mode in which each depress of the LINE FEED key steps the display through the sequence. The sequence is as follows:

1. All segments of all 32 characters illuminate simultaneously.
2. All segments of each character illuminate one character at a time, starting from the left.
3. Each character segment illuminates (all characters simultaneously) in sequence: A,B,C,D,E,F,L,I,K,H,M,J,N,G,D.P. Refer to PEPS-32430 RTL-4082A Display Board Schematic Diagram and Circuit Board Detail, for character segment designation.

4.3.2.2 Keyboard Test

When prompted to select test, enter "2". The display will return with: "KEYBOARD TEST" followed by "PRESS 1". Respond by depressing "1", and continue to depress each key requested in sequence. (Note: after 0 is depressed the display will prompt "ENTER =", representing the colon : symbol in this case.) The following keys are excluded from this test: BREAK, CTRL, SHIFT LOCK, REPT, RESET, and SHIFT (2 keys). If the wrong key is depressed, a key is depressed twice, or the keyboard system is defective to cause a wrong key entry, the display will respond with "(character)" PRESSED. To return to the sequence depress the SPACE bar.

4.3.2.3 Executive Board Test

When prompted to select test, enter "3". The display will return with: "EXEC BOARD TEST" followed by "SELECT SECTION". To test the RAM on the executive board enter "1". The display will indicate: "EXEC RAM TEST". After a brief interval, if the RAM verifies as good, the prompt "SELECT SECTION" will return. If an error is detected the display will indicate: "EXEC RAM TEST FAILED AT (Hex Address)". (The executive RAM is at locations E000 thru E3FF). The address displayed represents only the first location where an error was detected - there may be multiple failures, but they will not be displayed.

CAUTION

This message indicates that there is a fault in the RAM circuit, not necessarily in the RAM I.C.'s themselves. Refer all repairs to the Motorola Test Equipment Service Center.

If this message is displayed depress the SPACE BAR to return to the "SELECT SECTION" prompt.

To test the executive program ROM enter "2". The display will indicate: "CHECKSUM". After a brief interval, if the ROM verifies as good, the prompt "SELECT TEST" appears. If an error is detected the display will indicate: "CHECKSUM FAILED". Depress SPACE BAR for "SELECT TEST" prompt.

4.3.2.4 Input/Output Board Test

When prompted to select test, enter "4". The display will return with: "I/O BOARD TEST" followed by "SELECT SECTION". To test user RAM on the I/O board enter "1". The display will indicate: "USER RAM TEST". After a brief interval, if the RAM verifies as good, the display will read: "1K RAM ON BOARD" (or 4K with expanded memory option), followed by "SELECT SECTION". If an error is detected the display will indicate: "USER RAM TEST FAILED AT (Hex Address)". (The user RAM is at locations 0000 thru 03FF-1K or 0FFF-4K) The address displayed represents only the first location where an error was detected - there may be multiple failures, but they will not be displayed. If this message is displayed depress the SPACE BAR to return to the "SELECT SECTION" prompt.

Before testing the I/O ports, connect the ports labeled I/O 1 and I/O 2 together using one of the multi-conductor ribbon cable assemblies. Also connect I/O 5 and I/O 6 together with the other cable assembly. (Two 1V80305A29 I/O cables are included with R-1801A models). When prompted: "SELECT SECTION" enter "2". The display will indicate "I/O TEST". After about 8 seconds, if the I/O ports verify as good, the display will return to "SELECT SECTION". If a fault is detected the display will indicate "I/O 5 FAILED READ TEST" or "I/O 1 FAILED WRITE TEST", for example. The fail message does not indicate with certainty that the associated PIA or its cable is defective. For example, I/O 6 may be defective preventing I/O 5 from properly reading. (Note: Version A Executive software displays the I/O test as "PIA TEST", in reference to the corresponding Peripheral Interface Adapter I.C.s on the I/O Board. PIAs U301, U302, U303, and U304 correspond to I/O ports 1,2,5,and 6, respectively.)

4.3.3 Automatic Program Startup

Some application programs (RTL-4800A Code Plug Programmer, for example) are specially designed to provide automatic program entry when power is turned on or RESET is depressed. This feature is enabled only when this application ROM is installed in the ROM socket labelled U231 on the executive board. This eliminates the need for the user to type in the program name. In order to exit from this type of program the BREAK key must be depressed. This returns control to the Executive, allowing access to other programs and self-test routines, via the prompt: "ENTER PROGRAM NAME__".

6. Pg. 10, Section 5. MAINTENANCE
Paragraph 5.1 is expanded to include the following calibration procedures.

5.1.1 Analog-to Digital Converter Calibration

As a part of periodic maintenance the calibration of the A-to-D circuit should be checked to assure reliable performance of application programs which utilize the analog input.

Step 1. Lift the front panel of the unit to gain access to the I/O board located in the card cage. (See Figure 2 on page 2)

Step 2. Turn on power to unit. With a dc voltmeter measure the 5 volt supply output at a convenient point such as Q302 collector (See I/O Circuit Board Detail). Verify that the voltage is 5.0± 0.1 Volt. If it is not within this tolerance refer to paragraph 5.1.3 below, before continuing.

Step 3. Turn off power to unit. Connect a dc voltmeter between Q303 collector and ground, taking care not to short to the base of Q303. (I/O board may be either left in card cage or partially withdrawn to access test points and adjustment control.)

Step 4. Disconnect the analog/logic probe input cable at the front of the I/O board. With a test clip jumper pin 2 of P305 to pin 1 (ground).

Step 5. Turn on power to the unit. Check for voltage reading of +1.27vdc. Re-adjust R323 potentiometer as required.

Step 6. Turn off power, remove jumper from P305, connect analog/logic cable, disconnect voltmeter, and lower panel. Calibration complete.

5.1.2 Reader/Programmer Analog Output Calibration

As a part of periodic maintenance the calibration of the analog output circuit should be checked to assure reliable performance of application programs which utilize this output.

Step 1. Connect the power plug, located in the accessory compartment of the lid assembly, to the front panel connector labeled ACC PWR.

Step 2. Probe the center contact of the ANALOG OUTPUT BNC-type connector, on the reader/programmer module, with a dc voltmeter referenced to the shell (ground). The voltage should be -1.27vdc ±.06vdc. If the voltage is not within these limits continue to Step 3.

Step 3. Release the 4 quarter-turn type fasteners on the reader/programmer module front panel using either a bladed screwdriver or your thumb. Compress the spring loaded screw and turn counter clockwise. Extract the module from the upper case, but do not disconnect the power plug.

Step 4. Metering the ANALOG OUTPUT adjust R105 potentiometer with a tuning tool for a reading of -1.27vdc ±.01vdc. Refer to reader/programmer circuit board detail for R105 location. It is near the center of the board. Do not adjust the other pots on the board (R106 and R140).

5.1.3 5 Volt Power Supply Adjustment

Normally the power supply does not need to be adjusted. If, during periodic maintenance, the output is measured to be outside the limits of 5.0 ±0.1vdc, the supply should be readjusted. This procedure should be performed before the A-to-D or Analog Output calibration procedures.

Step 1. Follow the procedure outlined in the Maintenance Section (Section 5.2) and remove the control panel from the bottom case.

WARNING

Exercise adequate safety precautions when servicing the unit, high voltage exists within the unit.

Step 2. (Refer to Figure 6 on page 8) Locate the 5 Volt adjust pot R8 on the power supply module and adjust for 5.0 Volts, measured at the ACC PWR connector pin no. 5.

Step 3. Re-assemble the unit per the procedure of Section 5.2.

INSTRUCTION
MANUAL
REVISION

GENERAL

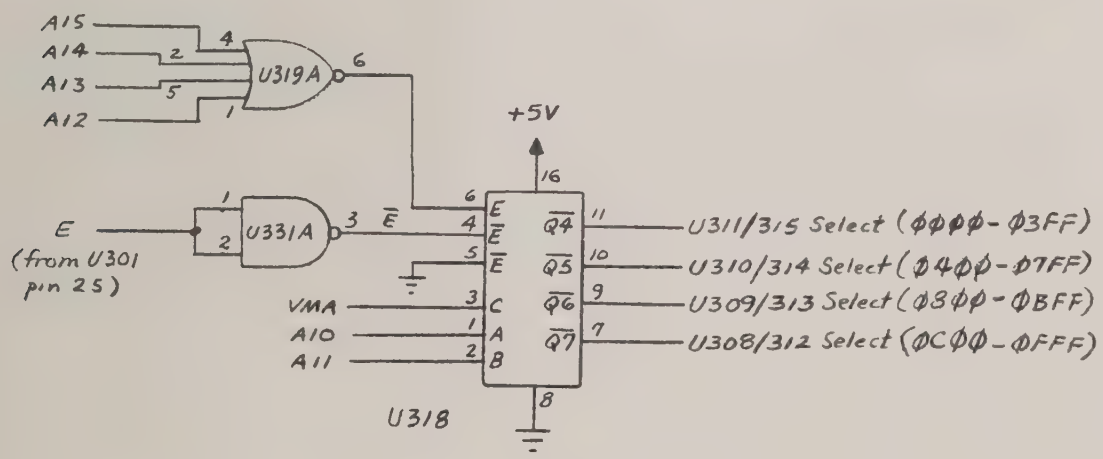
This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81069A90-O and -A Digital Analyzer/Controller R-1800A Instruction Manual

REVISION DETAILS:

On PEPS-32432, RTL-4080A I/O Schematic Diagram and Circuit Board Detail, circuit connections to I.C.s U331 and U318 have been changed; a partial schematic showing the revisions is drawn below. On printed circuit board versions prior to Issue B these changes were implemented by circuit plating cuts and wire jumpers. Cuts were made at I.C. U318-pin 4 and U331-pins 1 and 2 to disconnect them from ground and +5V, respectively. A wire was added between U331-pin 3 and U318-pin 4, and another between U331-pins 1 and 2 and U301-pin 25 (E), to complete the modification.



USER RAM ADDRESS DECODER

smr-4466
07/14/82

INSTRUCTION
MANUAL
REVISION

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED

68P81069A90-0 and A Digital Analyzer/Controller R-1800A Instruction Manual

REVISION DETAILS

Reference: PEPS-32431-0 (Sheet 2 of 2), RTL-4079A Executive Board Circuit Board Detail. On printed circuit board versions prior to Issue B the Vcc (+5V) and ground circuit paths to the address bus driver I.C.s (U212-U215) and to the data bus driver I.C.s (U234-U237) were isolated from other circuitry on the board and from each other by separate wires routed to the power connector J201. Six plating cuts made on the solder side of the circuit board disconnect these points from the original power distribution bus. These changes became effective August 11, 1982, and were required to assure continued reliable operation with application programs which reside in new generation EPROM integrated circuits currently being used.

smr-4492
08/26/82

INSTRUCTION
MANUAL
REVISION

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81069A90-0 and -A Digital Analyzer/Controller R-1800A Instruction Manual

REVISION DETAILS:

1. The RTL-1008A and RTL-1013A (console model) Reader/Programmer modules have been up-issued to include RTL-4083B and RTL-4087B circuit board kits. These B version kits are the same as A version kits described in the instruction manual except as detailed in paragraph 2. below.

2. On PEPS-32434, Reader/Programmer Schematic Diagram and Circuit Board Detail (Sheets 2 of 3 and 3 of 3),
   a. the voltage limiting circuit of Op Amp U22 and transistor Q22 has been changed. Instead of operating in a voltage comparator mode it has been re-configured to operate in a voltage follower mode. The I.C. has been changed to a higher performance part (see parts list below), resistor R71 has been deleted, and a connection has been made between U22 pin 6 and U22 pin 2 for unity voltage gain operation. A compensation capacitor (C46) has been added between pins 1 and 8. The circuit is designed to limit the voltage of the Ip current source (IP OUTPUT) to a level equal to the voltage applied to the VSAT INPUT plus 1.1 volts nominal. Usage is application dependent as determined by the PROM or code plug adapter module.
   b. The output of voltage regulator U29 has been increased to 32.0V nominal by changing the value of resistor R103. To maintain calibration of the Ip and Ipp current sources at this higher voltage resistors R78 and R84 were also changed. This voltage was increased to allow the VPP voltage regulator U26 to operate over a wider range for improved PROM programming yield. VPP usage is also determined by the application.

smr-4508
09/27/82

Revisions to parts list PL-7375-0

RTL-4083B Main Circuit Board
RTL-4087B Main Circuit Board (Console)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R103	6-83175C85	resistor, fixed: 5.76K ±1%; ¼w
R78, R84	6-83175C92	resistor, fixed: 9.53K ±1%; ¼w
C46	21-847743	capacitor, fixed: 8mmfd ±5%; 200v
U22	51-84561L22	operational amplifier

smr-4508
09/27/82

INSTRUCTION MANUAL REVISION

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81069A90-0 and -A DIGITAL ANALYZER/CONTROLLER

R-1800A INSTRUCTION MANUAL

REVISION DETAILS:

On PEPS-32434 (Sheet 2 of 3), Reader/Programmer Schematic Diagram, changes have been made to the VPP and VCC control circuits. The changes prevent these application-controlled voltage sources from being activated in the event the +5V power supply shuts down in the protective mode. The changes also eliminate potentially damaging transients that could otherwise occur during the normal power-on and power-off sequences.

Specific changes are as follows:

A. Diode CR95 was added in parallel with, and at the location of, capacitor C23. The anode of the diode is connected to -5V supply and the cathode to ground. During power down, after '-5V' voltage has decayed, the diode provides a low impedance path to ground. This allows the VPP and VCC control circuits to continue to inhibit their voltage sources during this transition.

B. In the base circuits of transistors Q37 and Q38, resistors R133 and R134 were changed from 56K ohm to 4.7K ohm. Also, resistors R141 and R142, both 2.7K ohm, were added from the base of each transistor to ground. The voltage divider configuration prevents these circuits from responding to transients occurring during power down.

C. Resistor R48 was changed from 2.7K ohm to 22K ohm and connected to '30V' supply instead of +5V. Similarly, resistor R50 was changed from 2.7K ohm to 10K ohm and connected to +15V supply instead of +5V. These changes make the VPP and VCC control circuits independent of the +5V supply.

D. Capacitor C14 (1 mfd) has been omitted. Capacitor C47 was added from U28 reference terminal to ground.

Revisions to parts list PL-7375-0

RTL-4083A Main Circuit Board
RTL-4087A Main Circuit Board (Console)

Reference Symbol	Motorola Part No.	Description
R133, R134	6-124A65	Resistor: 4.7K ± 5%; 1/4W
R141, R142	6-185A59	Resistor: 2.7K ± 5%; 1/8W
R48	6-124A81	Resistor: 22K ± 5%; 1/4W
R50	6-124A73	Resistor: 10K ± 5%; 1/4W
CR95	48-83654H01	Diode, Silicon
C47	08-857303	Capacitor: .0047±10%; 100V

SMR-4572
2-08-83

GENERAL

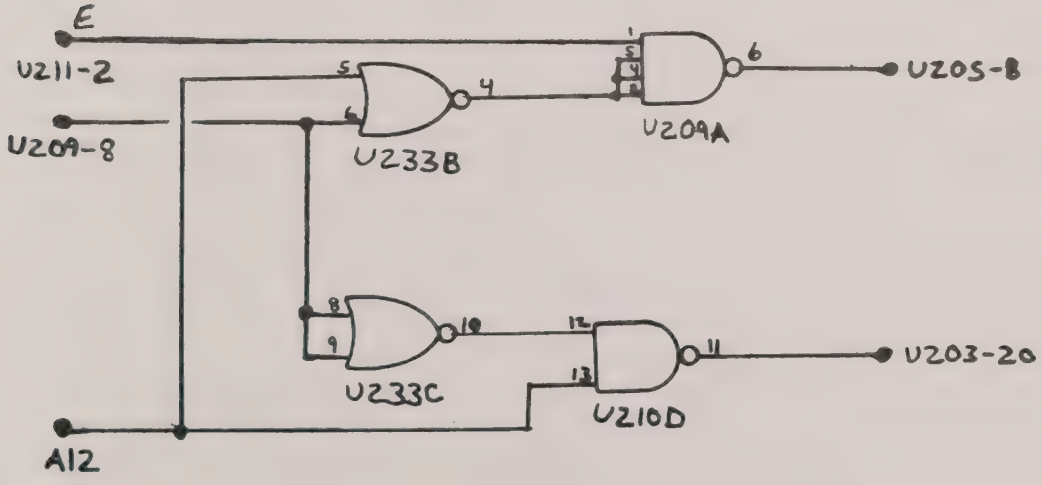
This revision outlines changes that have occurred since the printing of your manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81069A90-0 and -A — Digital Analyzer/Controller R-1800 Instruction Manual

REVISION DETAILS:

On PEPS-32431-0, RTL-4079A Executive Board Schematic Diagram and circuit board detail, Circuit connections to U205, U209, U210, U211 and U233 have been changed; a partial schematic showing the revisions is shown below.



MOTOROLA INC.

instruction manual revision

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81069A90-A R1800A Digital Analyzer/Controller

REVISION DETAILS:

The RTL-4079A Executive Board has been upgraded for future expansion of the software. In addition to these changes, the EEPROM field (U216-U231) has been moved to the front of the board for easy access when servicing. The upgraded version is functionally identical to the previous version. Insert the attached information in section 7, Diagrams and Parts Lists, after PEPS-32431.

ATTACHMENTS:

RTL-4079A Executive Board Schematic Diagram,
Circuit Board Detail, and Parts List.....PEPS-38673-0

Motorola
Communication
Sector

INSTRUCTION
MANUAL
REVISION

GENERAL

This revision outlines changes that have occured since the printing of your manual.

INSTRUCTION MANUAL AFFECTED

68P81069A90-A R-1800A DIGITAL ANALYZER/CONTROLLER

REVISION DETAILS

The following changes have been made to the R-1800A power supply RTP-4009A.

1) R17 has been changed from 430 ohm ¼ watt (P/N 06-124A40) to 1100 ohm ¼ watt (P/N 06-124A50).

2) A 4.7K ohm 1 watt (P/N 06-126A65) bleeder resistor has been added between the +43 volt line and ground.

SMR-4787
7-11-84

Motorola
Communications
Sector

SMR-4928
Instruction
Manual
Revision

GENERAL:

This revision outlines changes that have been made since the printing of your manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81069A90-A R-1800A Digital Analyzer/Controller

REVISION DETAILS:

The following change has been made to the R-1800A I/O board RTL-4080A:

R-310 has been changed from 130 ohm 1/4 watt (p.n. 06-124A28) to 1K ohm 1/4 watt (p.n. 06-124A49).

Motorola
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SMR-4935
Instruction
Manual
Revision

GENERAL:

This revision outlines changes that have been made since the printing of your manual. Use this information to correct your manual.

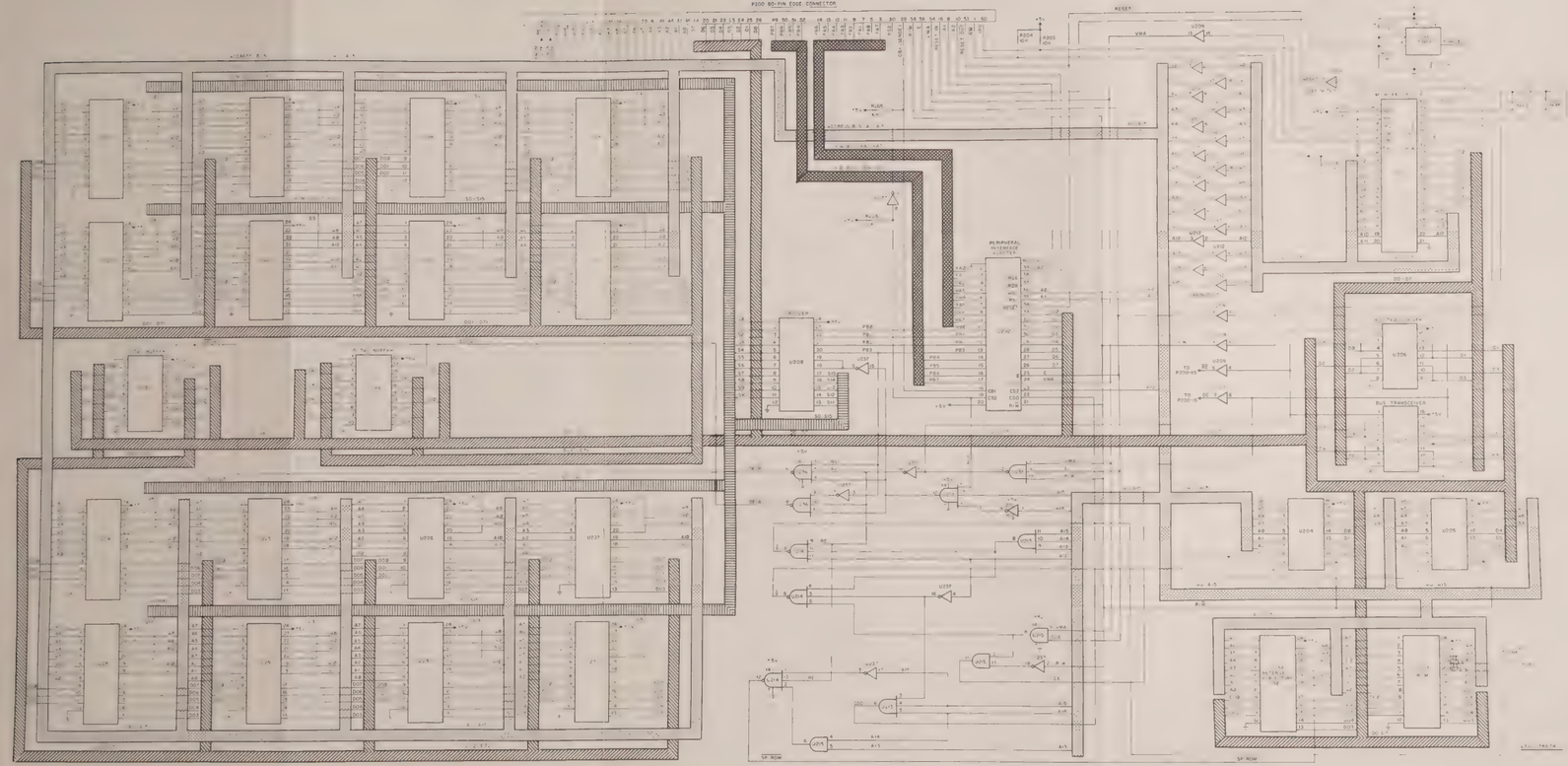
INSTRUCTION MANUAL AFFECTED:

68P81069A90-A R-1800A Digital Analyzer/Controller

REVISION DETAILS:

The following change has been made to the R-1800A PRP module RTL-4083 or RTL-4087:

U4 has been changed from MC14503 (p.n. 51-83627M64) to SN74LS367A (p.n. 51-84561L77).



NOTES:

1. Unless otherwise indicated, resistor values are in ohms, capacitor values are in microfarads, and inductor values are in millihenries.
2. This diagram shows positive logic:

   Logic "1" equals + 5 V
   Logic "0" equals 0 V
3. C201 through C240 are bypass capacitors connected between + 5 V and ground for each integrated circuit. C242 is connected to + 5 V and ground at P201.
4. Integrated circuits on this board are TTL and LSI CMOS devices.
5. Integrated circuit types and connections for this board are as follows.

Reference Designation	Description	Vcc + 5 V	Gnd
U201	Microprocessor	8	1
U202	PIA	20	1
U203	ROM (See note 6)	24	12
U204, 205	RAM	16	8
U206, 207	Bus Transceiver	16	8
U208	Decoder	24	12
U209-212	Bus Extender (See note 7)	16	8
U213	Triple Three-Input AND	14	7
U214	Triple Three-Input NAND	14	7
U215	Quad Two-Input AND	14	7
U216-231	User Program ROM	24	12
U232, 233	Octal Buffer	20	10
U234	For Future Use	24	12
U235	Timer	8	1
U236	Triple Three-Input NAND	14	7
U237	Octal Buffer/Driver	20	10

6. For U203 4k ROM, pin 20 is designated as: E/Progr.
   For U203 4k ROM, pin 21 is designated as: Vpp.
   For U203 8k ROM, pin 20 is designated as: E/Vpp.
   For U203 8k ROM, pin 21 is designated as: A12
7. Pins 1 and 15 are connected to ground on integrated circuits U209 through U212.

RTL-4079-A Executive Board Schematic Diagram and Circuit Board Detail and Parts List
Motorola No. PEPS-38673-O
(Sheet 1 of 2)
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parts list

RTL4079A Executive Board — PL-8892-O

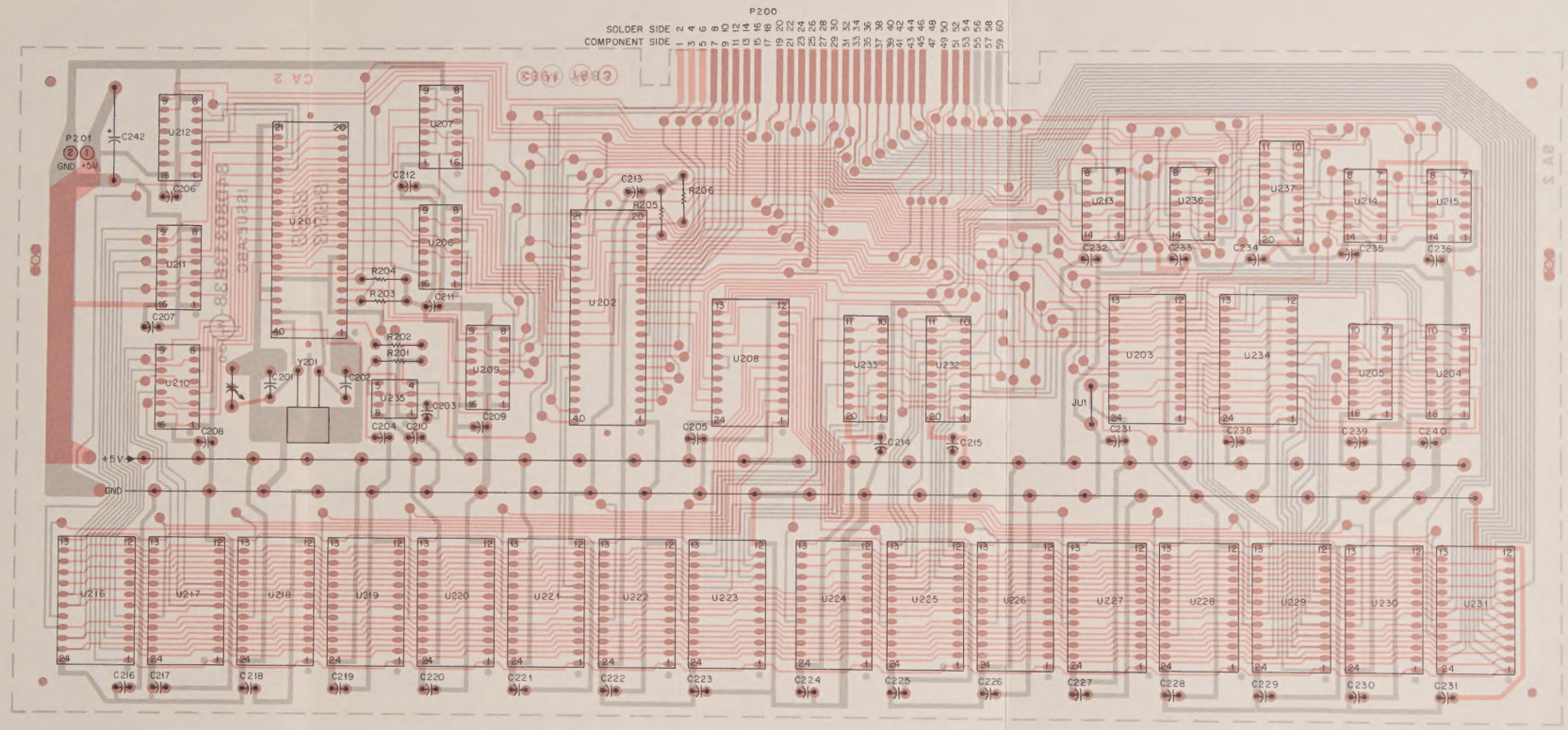
REFERENCE NUMBER	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C201, 202	21-84494B87	36 pF ±3%; 500 V
C203	21-84008H03	0.15 uF +80%-20%; 50 V
C204	21-84008H01	0.01 uF ±10%; 50 V
C205 thru C240	21-84008H03	0.15 uF +80%-20%; 50 V
C242	23-80348A60	100 uF ±10%; 10 V
		connector, plug:
P201	28-80333A40	male, 2-contact
		resistor, fixed: ±5%; 1/4 W: unless otherwise stated:
R201	6-124B22	1 meg
R202 thru 206	6-124A73	10k
		integrated circuit: (see note 1)
U201	51-80347A35	microprocessor
U202	51-84561L32	peripheral interface adapter (PIA)
U203	51-80364A01	read only memory (executive ROM)
U204, 205	51-82609M93	1024 x 4 RAM
U206, 207	51-83627M58	non-inverting quad three-state bus transceiver
U208	51-84371K38	4 to 16 line decoder
U209 thru 212	51-80347A36	hex three-state inverting buffer
U213	51-84561L44	triple 3-input AND
U214	51-84561L08	triple 3-input NAND
U215	51-84561L07	quad 2-input AND
U216 thru 231	See Note 2	application program ROM
U232, 233	51-82609M56	octal three-state buffer
U234	—	reserved for future use
U235	51-83629M50	timer
U236	51-84561L08	triple 3-input NAND
U237	51-82609M55	octal three-state buffer/line driver
		crystal:
Y201	48-80379A79	4.0 MHz 0.001%

mechanical parts

45-80347A11	LEVER, actuator (with roll pin); 2 used
9-80269B02	SOCKET, 24-contact; 17 used
9-83893M01	SOCKET, 40-contact
42-10217A24	TIE WRAP
31-80313B39	BUS BAR

note:

1. For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.
2. Refer to application program kit instruction section. (Supplied with application program ROM's).



COMPONENT SIDE ■ BD-DEPS-38675-O
SOLDER SIDE ■ BD-DEPS-38676-O
OL-DEPS-38677-O

SHOWN FROM COMPONENT SIDE

RTL-4079A Executive Board Schematic Diagram and Circuit Board Detail and Parts List
*Motorola No. **PEPS-38673-O***
(Sheet 2 of 2)
6/10/84-

ANALYZER/CONTROLLER

68P81069A90-A